Manual

WAGO Software

WAGO BACnet Configurator

for the Configuration of WAGO BACnet/IP Controllers 750-829, 750-830 and 750-831

Version 1.1.0, valid from SW Version 1.8

© 2014 by WAGO Kontakttechnik GmbH & Co. KG
All rights reserved.

The contents of this documentation are taken in part from the BACnet Standard 135-2010 or are based on the original contents. These contents are subject to copyright.

The following applies to these contents: ©2010, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (www.ashrae.org). Reprinted by permission from 2010 ASHRAE Standard-135. This material may not be copied nor distributed in either paper or digital form without ASHRAE's permission.

The following applies for the BACnet logo: BACnet® is a registered trademark of ASHRAE.

WAGO Kontakttechnik GmbH & Co. KG

Hansastraße 27
D-32423 Minden

Phone: +49 (0) 571/8 87 – 0
Fax: +49 (0) 571/8 87 – 1 69

E-Mail: info@wago.com

Web: http://www.wago.com

Technical Support

Phone: +49 (0) 571/8 87 – 7 77
Fax: +49 (0) 571/8 87 – 87 77

E-Mail: tcba@wago.com

Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

E-Mail: documentation@wago.com

We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally protected by trademark or patent.

Table of Contents

1 Notes about this Documentation 5
1.1 Scope 5
1.2 Copyright 5
1.3 Symbols 6
1.4 Number Notation 8
1.5 Font Conventions 8
2 Important Notes 9
2.1 Legal Bases 9
2.1.1 Subject to Changes 9
2.1.2 Personnel Qualification 9
2.2 System Requirements 10
2.3 Safety Advice (Precautions) 11
3 General 12
3.1 Installation of the BACnet Configurator and Service 12
3.2 Program Start 19
4 The WAGO BACnet Configurator 20
4.1 Function 20
4.1.1 BACnet Objects 21
4.1.1.1 Creation of BACnet Objects 21
4.1.1.2 BACnet Instance Numbers 23
4.1.2 BACnet Services 24
4.1.3 Configuration Files 25
4.1.4 EDE Files 26
4.1.5 terminal.csv File 26
4.1.6 Persistent and Configured Values 28
4.2 The Graphical User Interface 29
4.2.1 Menu Bar 30
4.2.1.1 File 30
4.2.1.2 Edit 30
4.2.1.3 View 30
4.2.1.4 Pool 32
4.2.1.5 Device 36
4.2.1.6 Extras 43
4.2.1.7 Help 44
4.2.2 Toolbar 45
4.2.3 Views 47
4.2.3.1 Device Pools 48
4.2.3.2 Structured View 50
4.2.4 Configuration Area 52
4.2.4.1 Pool 53
4.2.4.2 Device 54
4.2.4.2.1 Configuration of Device 58
4.2.4.2.2 Configuration of BBMD 60
4.2.4.2.3 Configuration of Communication 62
4.2.4.2.4 Configuration of IEC Variables 64

4.2.4.2.5 Node-Configurator ... 67
4.2.4.2.6 Storing and Downloading a Valid Configuration ... 69
4.2.4.3 Object ... 70
4.2.5 Device Manager ... 76
4.2.5.1 Object Manager ... 77
4.2.5.2 Client Mapping ... 79
4.2.5.3 Internal Mapping (IEC Mapping) ... 83
4.2.5.4 Multi-Controller Projects ... 85
4.2.5.5 Multistate ... 86
4.3 Online and Offline Status ... 88
4.4 Software Deinstallation ... 89

5 Example Configuration ... 90
5.1 Configuring New Devices ... 90
5.2 Use EDE File Import ... 103
5.2.1 EDE File Structure ... 103
5.2.1.1 Header ... 103
5.2.1.2 Required Properties ... 104
5.2.1.3 Optional Properties ... 106
5.2.2 Import Process ... 107
5.2.2.1 Hardware Instance Number ... 108
5.2.3 Creating and Importing an EDE File ... 110
5.3 Backing up and Restoring Files ... 115
5.4 Working with Persistent and Configured Values ... 117
5.5 Creating a Client Mapping ... 120
5.6 Creating an Internal Mapping ... 123

6 Appendix ... 126
6.1 List of BACnet Engineering Units ... 126
6.2 Compatibility with Configurator and Firmware Version ... 128

List of Figures ... 129

List of Tables ... 132

1 Notes about this Documentation

Note

Always retain this documentation!
This documentation is part of the product. Therefore, retain the documentation during the entire service life of the product. Pass on the documentation to any subsequent user. In addition, ensure that any supplement to this documentation is included, if necessary.

1.1 Scope

This documentation applies for the WAGO BACnet Configurator in conjunction with the 750-830 BACnet/IP Controller from firmware version 04.03.12 (04) and the 750-831 BACnet/IP Controller from firmware version 01.01.00 (01).

1.2 Copyright

This Manual, including all figures and illustrations, is copyright-protected. Any further use of this Manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and phototechnical filing/archiving (e.g., photocopying) as well as any amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG, Minden, Germany. Non-observance will involve the right to assert damage claims.

1.3 Symbols

DANGER

Personal Injury!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

DANGER

Personal Injury Caused by Electric Current!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Personal Injury!
Indicates a moderate-risk, potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Personal Injury!
Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Damage to Property!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

Note

Important Note!
Indicates a potential malfunction which, if not avoided, however, will not result in damage to property.

Information

Additional Information:
Refers to additional information which is not an integral part of this documentation (e.g., the Internet).

1.4 Number Notation

Table 1: Number Notation

Number code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	In quotation marks, nibble separated with dots (.)

1.5 Font Conventions

Table 2: Font Conventions

Font type	Indicates
italic	Names of paths and data files are marked in italic-type. e.g.: *C:\Programme\WAGO-I/O-CHECK*
Menu	Menu items are marked in bold letters. e.g.: **Save**
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: **File** > **New**
Input	Designation of input or optional fields are marked in bold letters, e.g.: **Start of measurement range**
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under **Start of measurement range**.
[Button]	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: **[Input]**
[Key]	Keys are marked with bold letters in square brackets. e.g.: **[F5]**

2 Important Notes

This section describes the legal principles and system requirements for using the software in compliance with intended purpose, underlying provisions and stated specifications.

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications that serve to increase the efficiency of technical progress. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

2.1.2 Personnel Qualification

Any steps related to the use of WAGO software may only be performed by qualified employees with sufficient knowledge of handling the respective PC system used.

Steps in which files are created or changed on the PC system may only be performed by qualified employees with sufficient knowledge in the administration of the PC system used in addition to the aforementioned.

Steps in which the behavior of the PC system in a network is changed may only be performed by qualified employees with sufficient knowledge in the administration of the network used in addition to the aforementioned.

2.2 System Requirements

Minimum system requirements:

Table 3: Minimum system requirements

Components	Requirements
Operating system	XP, Windows 7, Windows 8
Memory	128 MB or greater
Free hard disk storage	Min. 20 MB for the BACnet Configurator and 280 MB (x86) or 610 MB (x64) for the .NET 2.0 Framework[1)]
Monitor resolution	800 x 600 or greater
Other	Installed network card, .NET 2.0 Framework (redistributable included in delivery), network cable or hub Standard internet connection for software download on http://www.wago.com Administrator Rights for installation/deinstallation and the first program start External router[2)] (e. g. MBS BACnet-Router UBR-01)

[1)] If .NET 2.0 is not already installed.
[2)] Only necessary with BACnet MS/TP Controller 750-829 operation.

2.3 Safety Advice (Precautions)

Note

Use up-to-date security software!
Secure operation of the PC system can be at risk as a result of malware such a viruses and Trojans, as well as related threats such as denial-of-service attacks. Therefore, make sure that the latest security software and definitions are always installed on the PC system.

Note

Disable or uninstall software that is no longer required!
The vulnerability of a PC system against malware and related threats increases with the number of installed or active software components (applications and services). Therefore, uninstall or disable software components that are not needed for the purpose at hand.

3 General

This chapter describes the installation of the BACnet Configurator as well as the BACnet Service for accessing BACnet/IP Networks.

Here, a BACnet/IP Network is a network consisting of one or more IP subnets containing BACnet devices.

3.1 Installation of the BACnet Configurator and Service

The BACnet Configurator is installed on a PC that is connected to a BACnet/IP network through a switch, hub or router.

The installation depends on the network used.

BACnet/IP, e.g., when using the BACnet/IP Controller 750-830 or 750-831
The BACnet Configurator is installed on a PC that is connected to the BACnet/IP network by a switch, hub or router. The usual requirements for an IP network apply, e.g., unique IP address and matching network mask.

BACnet MS/TP, e.g., when using the BACnet MS/TP Controller 750-829
The BACnet Configurator is installed on a PC that is connected to the BACnet MS/TP network by a BACnet MS/TP router. Please note the requirements from the manufacturer of your BACnet MS/TP router.

Note: The 750-829 has two RJ-45 interfaces. However, BACnet communication occurs via the MS/TP fieldbus exclusively!

Information

Additional Information
The WAGO BACnet Configurator is a component of WAGO BACnet/IP Controller. You can download the software from the Internet site http://www.wago.com under Downloads → BACnet Downloads.

Note

Note the information in the Readme file!
A Readme file is included with the BACnet Configurator containing supplemental instructions, up-to-date information or current changes. Read through this Readme file before you install the BACnet Configurator. The file is located in your installation directory.
You can also open the file after installation via **Help** > **Show Readme-File** in the Configurator.

1. Double click on the file **“setup.exe”** in the installation directory to start the installation.

   If installing the BACnet Configurator on Windows 7 or higher, a dialog may appear asking if the software can be installed. Confirm to proceed with the installation.

2. Click on **[Next]** to start the next installation step.

WAGO BACnet Configurator
Welcome to the WAGO BACnet Configurator Setup Wizard
The installer will guide you through the steps required to install WAGO BACnet Configurator 1.8.0004 on your computer.
WARNING: This computer program is protected by copyright law and international treaties. Unauthorized duplication or distribution of this program, or any portion of it, may result in severe civil or criminal penalties, and will be prosecuted to the maximum extent possible under the law.
Cancel
< Back
Next >

Figure 1: Start Installation

3. Read the terms of the license carefully and select **[I Agree]**. Start the next installation step by clicking on **[Next]**.

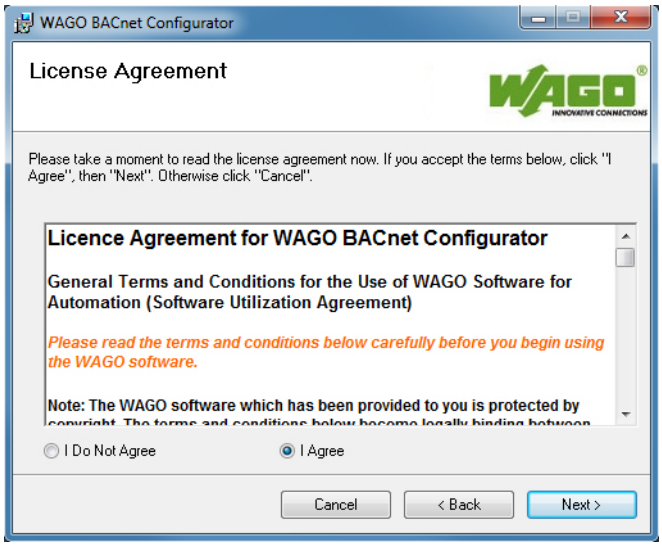

WAGO BACnet Configurator
License Agreement
Please take a moment to read the license agreement now. If you accept the terms below, click "I Agree", then "Next". Otherwise click "Cancel".
Licence Agreement for WAGO BACnet Configurator
General Terms and Conditions for the Use of WAGO Software for Automation (Software Utilization Agreement)
Please read the terms and conditions below carefully before you begin using the WAGO software.
Note: The WAGO software which has been provided to you is protected by
I Do Not Agree
I Agree
Cancel
< Back
Next >

Figure 2: Confirm the License Agreement

4. Enter the path under which you would like to install the Configurator and choose whether the software is to be installed for every user (“Everyone”) or only for yourself (“Just me”).

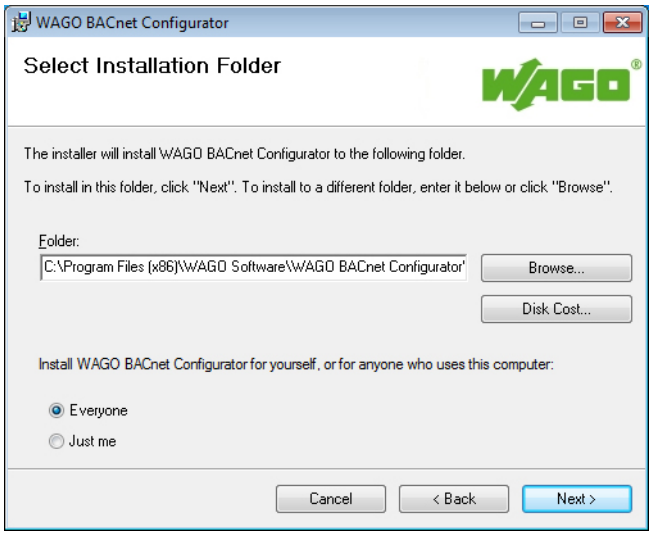

WAGO BACnet Configurator
Select Installation Folder
The installer will install WAGO BACnet Configurator to the following folder.
To install in this folder, click "Next". To install to a different folder, enter it below or click "Browse".
Folder:
C:\Program Files (x86)\WAGO Software\WAGO BACnet Configurator\
Browse...
Disk Cost...
Install WAGO BACnet Configurator for yourself, or for anyone who uses this computer:
Everyone
Just me
Cancel
< Back
Next >

Figure 3: Choose the Installation Location

5. Confirm further installation by clicking on **[Next]**.

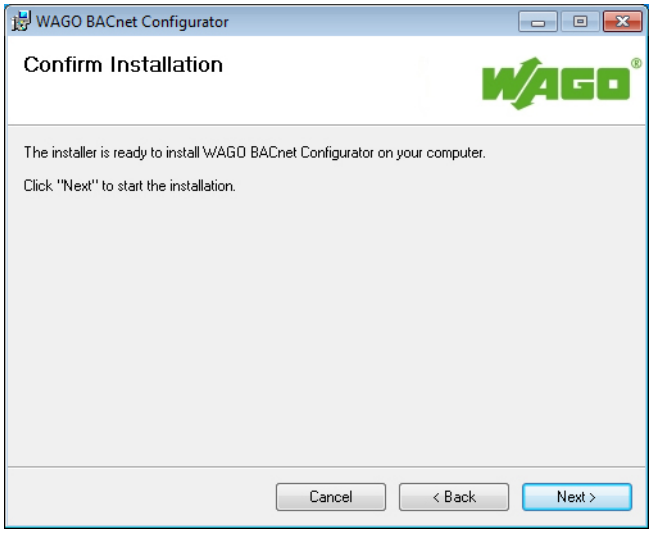

WAGO BACnet Configurator
Confirm Installation
The installer is ready to install WAGO BACnet Configurator on your computer.
Click "Next" to start the installation.
Cancel
< Back
Next >

Figure 4: Continue Installation

The Configurator is installed.

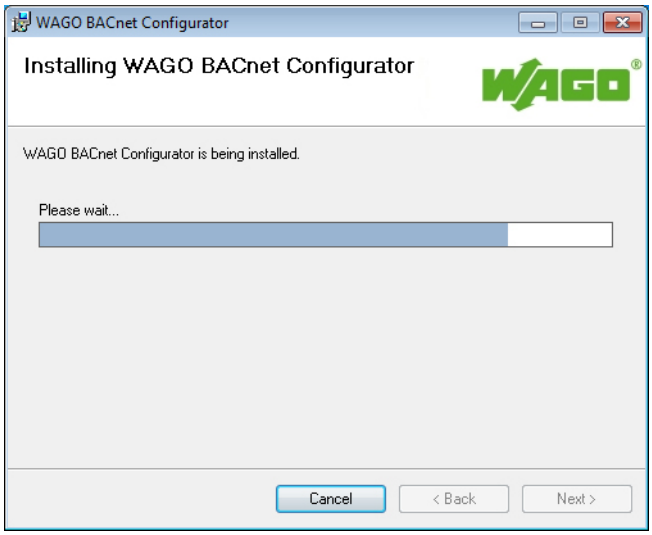


Figure 5: Continue Installation

You can select if you want to install the WAGO Merger in the following dialog. The “Also install or update WAGO BACnet Merger” option is enabled by default.

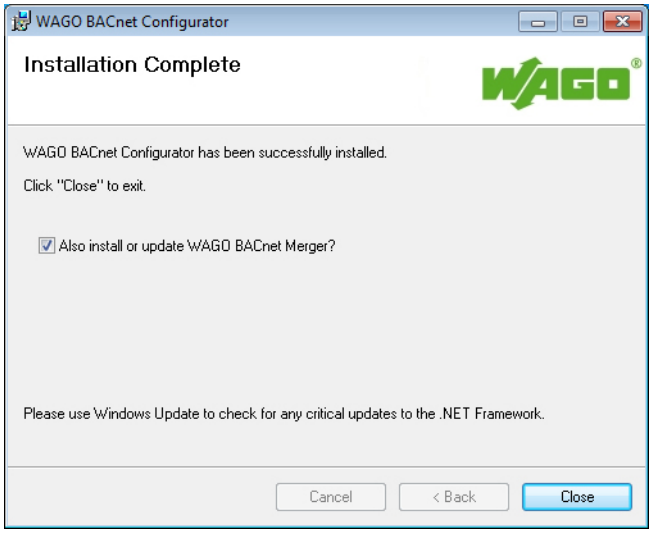

WAGO BACnet Configurator
Installation Complete
WAGO BACnet Configurator has been successfully installed.
Click "Close" to exit.
Also install or update WAGO BACnet Merger?
Please use Windows Update to check for any critical updates to the .NET Framework.
Cancel
< Back
Close

Figure 6: Installing Merger and Finishing the Installation

The Merger controls automatic import of the SYM_XML file into the BACnet Configurator. The SYM_XML file contains BACnet-specific variables for the IEC application that are used in the BACnet Configurator.

Process for making changes without Merger:

You create a new SYM_XML file for your modified WAGO-I/O-*PRO* program. You then load the application in your fieldbus controller and switch to the BACnet Configurator. In the BACnet Configurator, you import the modified SYM_XML file and load the changes in the fieldbus controller by **[Store and Download]**.

Process for making changes using the installed Merger:

After downloading the WAGO-I/O-*PRO* program to the BACnet controller, a dialog inquires if the BACnet image should be updated. After confirmation, a new SYM_XML file is automatically generated and written to the fieldbus controller. After logging out of the controller, the fieldbus controller restarts and the changes are applied.

If you use the Merger, you no longer need to switch between WAGO-I/O-*PRO* and BACnet Configurator nor import and download the SYM_XML file in the BACnet Controller.

6. Click **[Close]** to finish the installation.

In addition to the BACnet Configurator and the Merger, a BACnet Service (BACstac) is automatically installed in the background. The BACnet Configurator gains access to a BACnet/IP network via the installed service.

Note

Firewalls/Virus scanners may prevent installation!
If an error occurs during BACnet installation, this may be due to an active firewall or a virus scanner that is installed. It may be necessary to deactivate the virus scanner or firewall being used while installation is in progress. Contact your system administrator about this.

Note

Install BACstac to use the BACnet Configurator!
BACstacs is automatically installed when installing the BACnet Configurator. Searching for network participants and their configuration in the BACnet Configurator is not possible without installing BACstac.

Note

Capture BACnet Service in firewall rules if necessary!
The service may be blocked during installation by a firewall. If necessary, accept the BACnet Service manually in the firewall rules since this never happens automatically.
If, in spite of this, the BACstac is not automatically installed, proceed as described in section "Manual Installation of the BACnet Service" and install the BACstac manually.

Note

Established active network connection to use BACstac!
An active network connection is required to install and use the BACstac.

7. Click in the installation window on **[Close]** to end the setup.

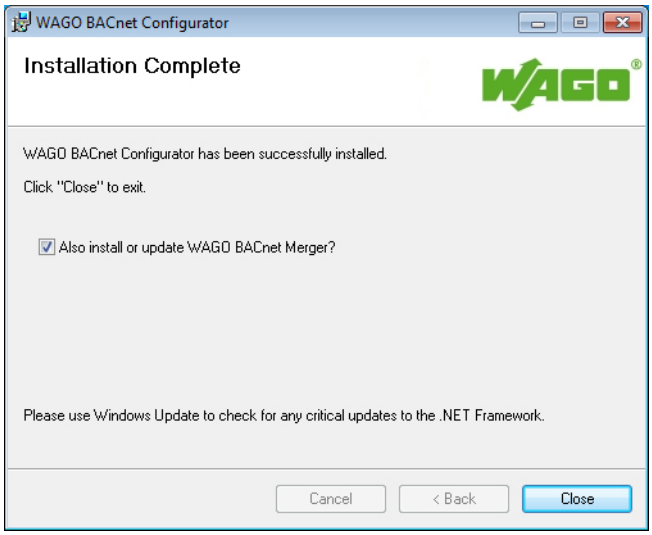

WAGO BACnet Configurator
Installation Complete
WAGO BACnet Configurator has been successfully installed.
Click "Close" to exit.
Also install or update WAGO BACnet Merger?
Please use Windows Update to check for any critical updates to the .NET Framework.
Cancel
< Back
Close

Figure 7: End Installation

The installation of the BACnet Configurator and BACnet Service is finished.

If BACnet controllers in the network are not automatically scanned when launching the Configurator, BACnet Service may not be installed correctly. An active firewall, for example, may be one reason for an unsuccessful installation. In this case, perform the following steps and check the correct assignment of the IP address for the network card and restart the BACnet Service.

Note

Check IP settings before starting the BACnet service!
The BACnet service checks that the IP settings are assigned correctly. Make the IP settings before you start the BACnet service.

1. Go to **Tools** > **BACstacs Settings** in the BACnet Configurator.

The BACstacs settings are displayed.

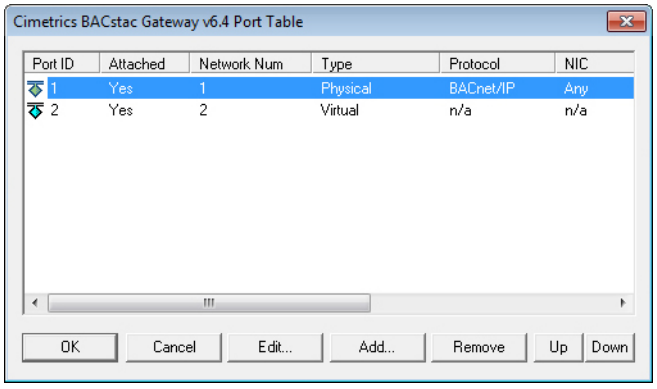


Figure 8: Properties of the BACnet Service

2. Click on **[Edit...]** to open the configuration of the BACnet Service.

3. In this dialog, you will configure BACnet access as needed and set the IP address of the network card.

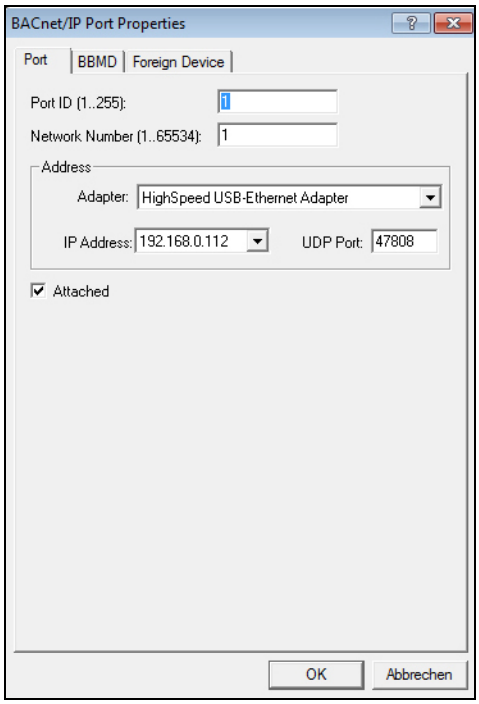


Figure 9: Properties of the BACnet Service

4. Close the dialog by clicking **[OK]** to save changes or by clicking **[Cancel]** to close without saving.

The installation of the BACnet Configurator and BACnet Service is finished.

If necessary, you can start or restart the service from the control panel.

5. Open the **Control Panel**, select **Administrative Tools** and then **Services**.

6. The BACstacs status is displayed (here: “Started”).
Right-click on the service to stop, restart or change the properties of the service.

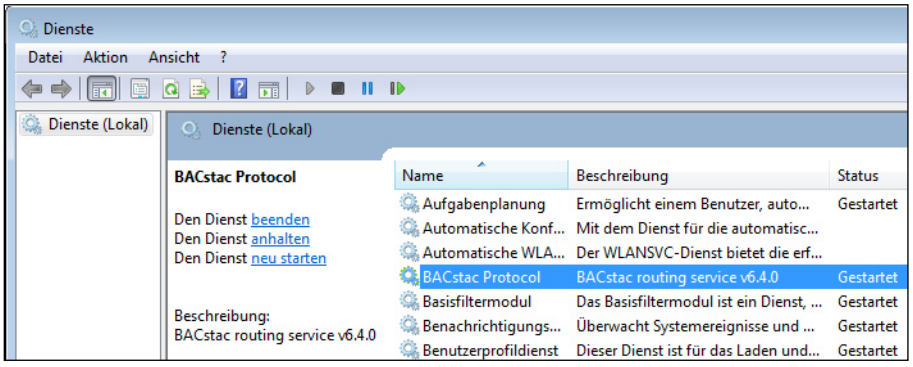


Figure 10: Stop or Restart the BACnet Service

7. Restart the BACnet Configurator.

3.2 Program Start

The BACnet Configurator can only be used to its full extent when operating with at least one WAGO fieldbus controller. If no WAGO fieldbus controller is detected after program start, some functions of the BACnet Configurator are unavailable (DEMO mode).

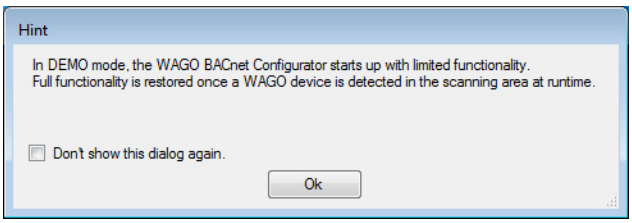

Hint
In DEMO mode, the WAGO BACnet Configurator starts up with limited functionality.
Full functionality is restored once a WAGO device is detected in the scanning area at runtime.
Don't show this dialog again.
Ok

Figure 11: Message Box for Restricted Functionality

The BACnet Configurator starts in DEMO mode by default. Immediately after starting, the BACnet Configurator scans for devices in the network. When at least one WAGO fieldbus controller is detected, the BACnet Configurator automatically switches from DEMO mode to FULL mode. In FULL mode, the user has unrestricted access to all functions until the program is closed.

The following table provides an overview of the functions available in DEMO mode when the BACnet Configurator is operated with no devices or with third-party devices only:

Table 4: Functions in Restricted Mode (DEMO Mode)

Function	Availability
Commit Values (describe properties)	**x**
Services (Reset, Backup and Restore, Restore with …, Communication Control …, Synchronize Time …, Add Object)	**x**
Import, Export	**x**
Database (add to database, store to database)	**x**

4 The WAGO BACnet Configurator

The WAGO BACnet is an independent commissioning, configuration and management software. The tasks of the BACnet Configurator include, among other things, the logical structuring of the project and BACnet devices within a BACnet/IP network, the addressing of the controller, the configuration of the client and the server in each individual WAGO BACnet/IP controller as well as a value browser for viewing BACnet object properties.

4.1 Function

The central component of the BACnet Configurator is the database for managing BACnet devices. For BACnet/IP controllers from WAGO, all configuration information is stored in this database and can therefore be stored and re-stored at any time. The configuration information of a controller includes, among other things, the file “SYMXML.SYM_XML” ,SYM_XML file for short, that contains the program variables of the IEC application, and the so-called Override file that contains configuration data created by means of the BACnet Configurator.

BACnet devices and objects are displayed, on the one hand, in a flat, non-hierarchical network view and, on the other hand, in a structured view that can be freely configured by the user (Structured View). The Structured View allows the user to organize BACnet devices and objects according to logical aspects, such as their location or responsibility within a building.

Changes can be made online and/or offline, depending on the type of configuration data, i.e. with or without a connection between the BACnet/IP Controller and the PC on which the BACnet Configurator is installed. If, for example, devices in the BACnet/IP network are being sought, IP settings are being set or data is being backed up/restored, these changes are done online. Changes can be made to configurations of BACnet objects, Client Mappings (links between BACnet properties) and BACnet network settings (e.g. for BBMD, PTP, etc.) both online and offline. In offline changes, the new data are first saved in the database and can be downloaded at a later time into the desired devices.

In summary, the BACnet Configurator queries, monitors and alters current values of object properties. Supplemented by a whole series of BACnet services, the user can thus act on a BACnet/IP network.

4.1.1 BACnet Objects

According to the BACnet Standard, 25 different objects and 38 services are supported (Last update: BACnet Standard SSPC 135-2004). An object is structured in several object-specific properties. These properties are altered using services.

Objects can be created and configured and the default values of their properties can be changed in the BACnet Configurator. Three types of objects are differentiated:

1. BACnet objects defined by the IEC or SYM_XML file (SYM_XML objects)

2. Automatically installed BACnet objects that represent the inputs/outputs of the modules connected to the controller (native objects)

3. BACnet objects created by the BACnet Configurator (override objects)

Even if the BACnet Configurator recognizes and displays the origin of an object (SYM_XML, native, override), it presents all three types of objects in the same manner and allows a uniform handling of all types of objects.

4.1.1.1 Creation of BACnet Objects

The manual creation of objects or the import of an EDE or SYM_XML file (IEC) are not absolutely necessary for the controller to run. If the BACnet Configurator is started without any additional settings, configurations or imports, the controller creates objects that are available through the connected module constellation (native objects) in online mode.

The properties of the automatically created, native BACnet objects of the digital and analog inputs and outputs are given default values. The default values can be configured in the user interface. For the first boot up of the controller, default values saved in the firmware are used in the objects, e.g. "111" for the property "Limit_Enable" of the Analog-Input Object.

Other objects, in addition to the automatically installed objects, can also be created.

Table 5: Other Objects, in Addition to the Automatically Installed Objects, Can also Be Created

BACnet Object	Description
ACCUMULATOR	Count value entry; counts incoming impulses
ANALOG_INPUT	Analog input; measures voltage or temperature, for instance
ANALOG_OUTPUT	Analog output; is used to position controllers, for instance
ANALOG_VALUE	Analog value; results from a calculation, for instance
AVERAGING	Statistical average and standard deviation; calculates the average and standard deviation of a referenced property
BINARY_INPUT	Binary input; measures whether a switch is switched on or off, for instance
BINARY_OUTPUT	Binary output; alternates between two states
BINARY_VALUE	Binary value; represents one of two possible states
CALENDAR	Calendar; contains data lists for creating days/times/etc. with special status (e.g. holidays)
COMMAND	Command; writes a predefined list of properties, one after the other
EVENT_ENROLLMENT	Event category, defined reactions to events
FILE	File; represents a file that can be read and/or written using BACnet services
GROUP	Group; used to group property values
LIFE_SAFETY_POINT[1)]	Safety point; encapsulates information on the status of a hazard report
LIFE_SAFETY_ZONE[1)]	Safety zone; summarizes safety points and/or additional safety zones
LOOP	Controller, performs regulation functions
MULTISTATE_INPUT[1)]	Multi-level input, delivers reports on states such as off/on, open/closed as a coded number
MULTISTATE_OUTPUT[1)]	Multi-level output, delivers the output states of commands
MULTISTATE_VALUE	Multistate value; represents one of several possible states
NOTIFICATION_CLASS	Notification class; assigns alarm and event reports to one or more recipients
PROGRAM[1)]	Program control; starts, monitors, controls, loads programs into a BACnet device
PULSE_CONVERTER	Impulse converter; converts counted impulses into physical units.
SCHEDULE	Schedule; for establishing certain actions at predefined times
TREND_LOG	Trend log; records time- or event-based changes in property values

1) The option to create this object depends on the respective fieldbus controller and the firmware used.
More detailed information about whether a fieldbus controller supports an object is available in the PICS of the corresponding fieldbus controller.

Table 6: Objects that are not Created Using BACnet Configurator

Object	Description
DEVICE	Device; represents the BACnet/IP Controller. There is only one device object that is automatically created by the controller.

Note

Observe maximum number of objects!

The maximum number of objects that can be created differs in the various fieldbus controllers.

More detailed information about how many objects can be created is available in the user manual of the corresponding fieldbus controller.

4.1.1.2 BACnet Instance Numbers

Each BACnet device within a BACnet network must possess a unique instance.

The instance number is the object instance number of the device's Device Object and can be read from the Object ID of the Device Object.

Object ID	
Object Type	Object Instance Number

The instance number is generated from the first (lowest value) 22 bits of the MAC address of the BACnet/IP controller:

MAC address of the controller: 00:30:DE:02:11:3F
22 bits (LSB) of the MAC address ~~00:30:DE:~~02:11:3F

$0x2113F_{hex} = 135487_{dez}$
The instance number of the BACnet/IP controller is 135487 in this case.

There is still the possibility of reconfiguring instance numbers. Automatic generation only affects the standard instance number without configuration.

Note

Deleting instance numbers causes the property values transferred at runtime to be deleted!
By changing the instance number of an object, all persistent property values of the respective object will be deleted. From that point, the configured values will be used. Persistent property values are those values which you have loaded into the controller using the “Commit_Value” function.

Information

Additional Information
The name of a device that is still unconfigured is determined as follows by the controller and displayed in the BACnet Configurator: “Device_[MAC-Address]”. By appending the MAC address along with the instance number, the device name can also be uniquely resolved as such in the network.
Example, “Device_0030de02113f”.

4.1.2 BACnet Services

The following table shows which BACnet services are used by the functions of the WAGO BACnet Configurator.

Table 7: BACnet Services

Function	BACnet Service(s)
Searching the network using Scan-Dialog	• Who-Is • I-Am (received) • ReadProperty • ReadPropertyMultiple (only if "Scan Objects" is set)
The existence of one or more found or fixed, entered devices from the pool Scan is tested. The search is conducted either manually, or automatically if the device is selected in the tree, added to the database or opened for configuration for the first time.	• ReadProperty • ReadPropertyMultiple
Automatic device search (“Device Auto Discovery”)	• Who-Is • I-Am (received) • ReadProperty
Online/offline monitor for devices	• Who-Is • I-Am (received) • ReadProperty
Monitor for property values	• ReadProperty
Writing of a property value	• WriteProperty
Restart of a device	• ReinitializeDevice (cold or warm start)
Time synchronization	• TimeSynchronization
Communication behavior of the device	• DeviceCommunicationControl
BACnet file transfer	• ReadProperty • AtomicReadFile(if a file object is being read) • AtomicWriteFile (if a file object is being written)
BACnet- backup and restoration	• ReadProperty • ReinitializeDevice (StartBackup, EndBackup, StartRestore, EndRestore, AbortRestore) • AtomicReadFile (during a backup) • AtomicWriteFile (during a restoration)
Creating and deleting objects during run time	• CreateObject • DeleteObject

4.1.3 Configuration Files

The BACnet Configurator processes different configuration files:

- The file “SYMXML.SYM_XML”, **SYM_XML file** for short, is created using the software WAGO-I/O-*PRO*. The file contains, among other things, all BACnet-specific variables of the IEC application (IEC variables). In order to further process these IEC variables, the SYM_XML file is imported into the BACnet Configurator (either offline or online by uploading from an already configured device). IEC variables and BACnet objects defined by IEC variables can be configured and linked with BACnet object properties in the BACnet Configurator. An IEC variable can only be linked if it has not already been assigned permanently to a property by SYM_XML.

- The **Override File** contains all configuration information created with the BACnet Configurator, for example the previously described assignment of IEC variables to object properties, but also default values of properties and Client Mappings.
  The name "Override" implies that the configuration information in this file has precedence over the standard configuration settings in the controller firmware.
  Every Override File is an XML file according to Extensible-Markup-Language (XML) 1.0, Fourth Edition. Therefore, a large part of this description consists of XML element definitions. The Override File can be installed, processed and uploaded.

- The **WAGO Database XML** contains generic BACnet devices and WAGO BACnet devices. The SYM_XML file (if available) and the Override file (always present) are stored in the database for WAGO BACnet devices. All BACnet configuration information is included. Each external BACnet device is stored as a summary of its objects, properties and property values. The file format corresponds to the format of the Over-ride file.

- The file **persistent.bin is** a configuration data memory for changes in run-time. Data that are transmitted ad hoc via “Commit Value” to the controller are saved here. The file is used by the Configurator and should not be manually altered.

The central configuration files, SYM_XML and Override, for all WAGO BACnet/IP controllers found in the database of the BACnet Configurator are saved. It is therefore possible to recover a configuration at any time.

4.1.4 EDE Files

EDE files are used for exchanging BACnet device information between different manufacturers. The device information contains objects or default values for certain properties contained in the device, for instance.

EDE files can be created and imported by the BACnet Configurator. These are not (device) configuration files since not all information on an object is usually listed in an EDE file.

EDE files are processed in the “csv” data format. MS Excel can be used, for example, to edit CSV files, making EDE import well-suited to quickly and easily creating a number of objects.

Information

Additional Information
The definition of the EDE format can be found on the web site http://www.big-eu.org/service/software.php.
Please refer to section “Use EDE File Import” for more information about using the EDE file.

4.1.5 terminal.csv File

The “terminal.csv” file is automatically created when installing the BACnet Configurator. The file is located in the installation folder of the BACnet Configurator (usually C:\Programs\WAGO Software\WAGO BACnet Configurator) and contains a list of all WAGO terminal blocks currently available with associated item number and number of digital/analog inputs/outputs. If bus modules are supplemented, the file can be replaced.

The file is in CSV format, making it possible to use programs such as MS Excel to open and edit it when changes are needed. The current “terminal.csv” file is available to download on the WAGO website (http://www.wago.com → Downloads → Building Automation → BACnet-Downloads).

File Structure

One terminal block is listed per line. The lines are unsorted.

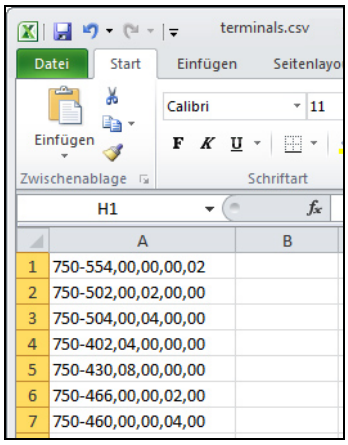


Figure 12: “terminal.csv” Excerpt

Each line contains 5 columns or areas delimited by commas:

750-402,04,00,00,00

Number of analog output objects
(2-digit decimal number from 00 to 16)

Number of analog input objects
(2-digit decimal number from 00 to 16)

Number of binary output objects
(2-digit decimal number from 00 to 16)

Number of binary input objects
(2-digit decimal number from 00 to 16)

WAGO Item Numbers
The following syntax is valid:
(using the example of module 750-402)
750-0402
750-402/000-000
0750-0402/0025-0000

Examples:

- 750-402,**04**,00,00,00 - Module with 4 digital inputs
- 750-504,00,**04**,00,00 - Module with 4 digital outputs
- 750-466,00,00,**02**,00 - Module with 2 analog inputs
- 750-554,00,00,00,**02** - Module with 2 analog outputs

The BACnet Configurator import function is used to import an EDE file as a **“WAGO Device”**. The “terminal.csv” file is then applied in the BACnet Configurator and evaluated in terms of the information contained.

Information

Additional Information
Please refer to section “Use EDE File Import” for more information about the “terminal.csv” file in combination with importing EDE files.

4.1.6 Persistent and Configured Values

Values of object properties can be changed in two ways in the BACnet Configurator:

In the configuration area (display of configured values)
All settings for objects, properties and values are done here. Changes to properties of an object are marked with a symbol. The entire configuration is loaded into the controller.

In the runtime environment (display of life values)
Fast, convenient changing of one or more property values and direct loading into the controller. The data will be persistently stored.

Note

Configured data overwrites persistent runtime values!
Properties that have been changed in the configuration area and marked as changed overwrite the persistent runtime values. Persistent values remain when downloading a configuration only if these values have not been changed in the configuration area.

An example of working with persistent and configured values can be found in section “Working with Persistent and Configured Values”.

4.2 The Graphical User Interface

The graphical user interface of the WAGO BACnet Configurator is described in the following.

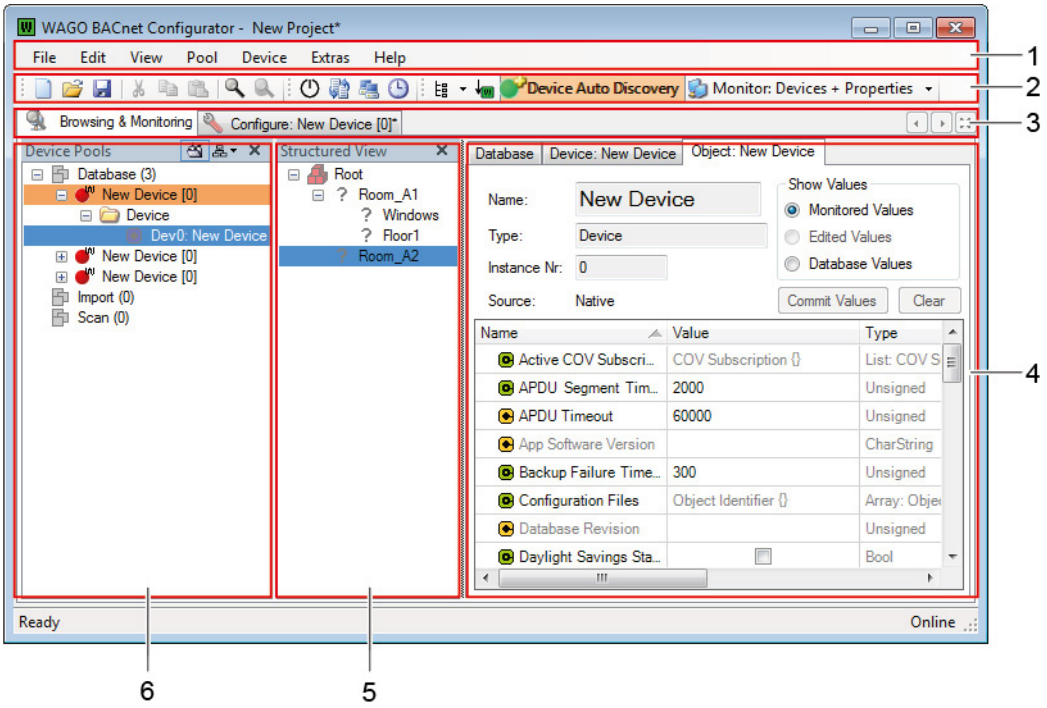


Figure 13: Graphical User Interface

Tabelle 8: Legende zur Abbildung „Grafische Benutzeroberfläche“

Pos.	Bedeutung
1	Menu bar (see section “Menu Bar”)
2	Toolbar (see section “Toolbar”)
3	Views (see section “Views”)
4	Device Pools (see section “Device Pools”)
5	Structured View (see section “Structured View”)
6	Configuration area (see section “Configuration Area”)

4.2.1 Menu Bar

4.2.1.1 File

The menu item **File** is used to create, open, save and close projects.

Table 9: Menu Item File

Menu Item	Description
New Project	Create new project
Open Project...	Open existing project
Save Project	Save processed project
Save Project as...	Save processed project as
Exit	End program

4.2.1.2 Edit

The menu item **Edit** is used to edit objects in the “Configure” tab.

Table 10: Menu Item Edit

Menu Item	Description
Cut	Cutting selected objects or object properties
Copy	Copying of selected objects or object properties
Paste	Insertion of selected objects or object properties

4.2.1.3 View

The menu item **View** is used to switch between different views.

Table 11: Menu item View

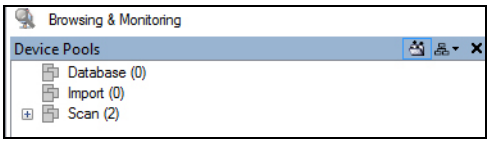
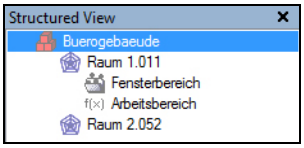
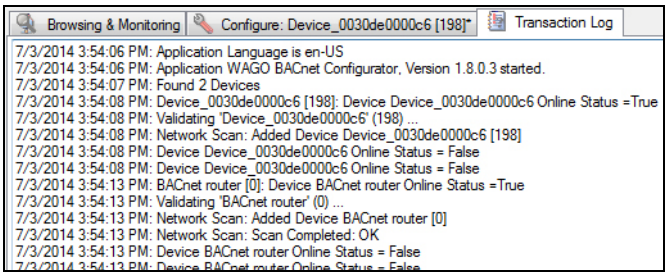
Menu Item	Description
BACnet Browser	The BACnet Browser "Browsing & Monitoring" displays the "Device Pools" and "Structured View" tabs on the left side and the configuration area on the right side. The "Browsing & Monitoring" and "Device Pools" tabs are displayed when starting the BACnet Configurator as standard procedure.  Figure 14: “Browsing & Monitoring” tab
	Switching between folder view and list view for objects of a device
	Sorting of the devices in ascending or descending order in alphabetical order, according to online status, device or vendor ID.
	Closing the Device Pools view

Table 11: Menu item View

Menu Item	Description
Structured View	The Structured View represents a logical network construction in a tree structure of folders, subfolders and devices. It is opened by clicking on the “View” button in the toolbar.  Figure 15: “Structured View”
	Closing the Structured View
Transaction Log	In the “Transaction Log” tab, all actions since the start of the software are documented with a time stamp.  Figure 16: Transaction Log
	[Copy to Clipboard] Copying of the content of the Transaction Log onto the clipboard
	[Clear Transaction Log] Delete all entries in the Transaction Log

4.2.1.4 Pool

The menu item **Pool** is used to configure the three Device Pools (Scan, Import, Database). Depending on the selected pool, some of the sub-items are enabled or disabled.

Table 12: Menu Item Pool

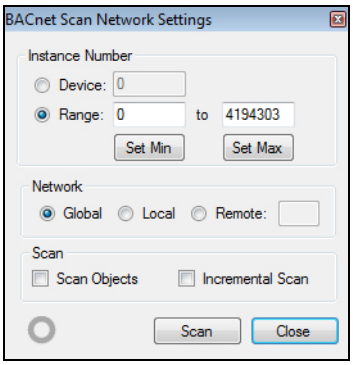
Menu Item	Description	
Scan...	The Scan Dialog is non-modal and also remains open with a click in the main window. The dialog is used to search the network for BACnet devices. Found devices are displayed in the Scan pool.  Figure 17: Search for BACnet devices	
	Instance Number	
	-Device	Instance of a particular device
	-Range	Instance number of a range
	-[Set Min]	Lower limit of the instance numbers
	-[Set Max]	Upper limit of the instance numbers
	Network	
	-Global	Sending of the request to all accessible subnetworks
	-Local	The request is only sent to the subnetwork to which the PC is connected
	-Remote	The request is sent to a network number 1-65534.
	Scan	
	-Scan Objects	Querying of devices and objects
	-Incremental Scan	Adding new devices without discarding already scanned devices
	[Scan]	Execution of the network search
	[Close]	Closing the dialog - has no effect on the network search
Rescan All Devices…	Rescan all devices from the Scan pool	
Device Auto Discovery	Execute automatic device recognition and device search in the network immediately	
Monitor All Devices	Automatic status query of all devices, if selected	

Table 12: Menu Item Pool

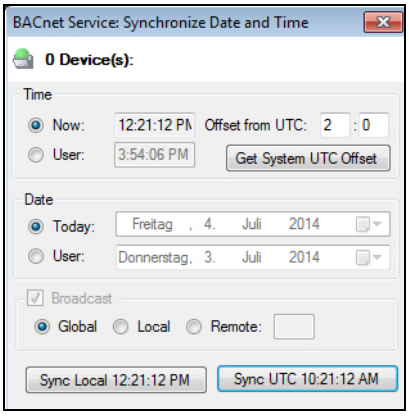
Menu Item	Description	
Services		
-Synchronize Time...	Opening a dialog for time synchronization of the devices In this dialog, the time offset in hours and minutes in relation to UTC time (Greenwich meridian), which is independent of summer (daylight savings) and winter (standard) time, is set.  Figure 18: Synchronize time	
	Time	
	-Now	System time of the PC
	-User	Freely adjustable time
	-[Get System UTC Offset]	Automatic calculation of the time offset
	Date	
	-Today	Locally set date
	-User	Date of another user
	Broadcast	
	-Global	Sending of the request to all accessible subnetworks
	-Local	The request is only sent to the subnet-work to which the PC is connected
	-Remote	Network number 1-65534
	[Sync Local _ : _ : _]	Synchronizing of device time with PC time
	[Sync UTC _ : _ : _]	Synchronizing of device time with UTC
Add		
-Wago Device	Adding of new WAGO BACnet/IP controllers, if the Database pool is chosen.	

Table 12: Menu Item Pool

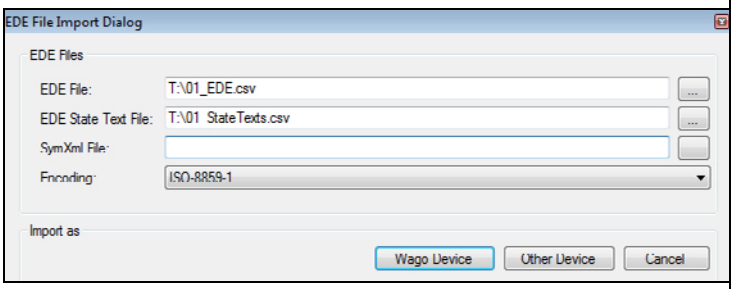
Menu Item	Description	
Import		
-EDE...	Importing of EDE files If EDE files are imported, the devices described in them are taken into the Import pool. From there, they can be taken into the database. WAGO devices can be further configured. Please refer to section “Use EDE File Import” for more information about EDE import.  Figure 19: Importing an EDE file	
	EDE Files	
	-EDE File	Importing of the EDE file “EDE File”; contains a list of all objects
	-EDE State Text File	Importing of the EDE file “EDE State Text File”; contains descriptions of states, e.g.”0/1” or “on/off” for digital values
	-SymXml File	Selecting the file “SYMXML.SYM_XML” with objects created in WAGO-I/O-*PRO*
	-Encoding	Selection of a character coding for EDE files: ISO-8895-1, ASCII or UTF8
	Import as	
	[WAGO Device]	The incorporated EDE files are imported as WAGO devices. The “terminal.csv” file is evaluated in the installation directory of the BACnet Configurator. It contains all WAGO modules with item number and number of digital/analog inputs/outputs for mapping the specific module type in the Configurator.
	[Other Device]	Importing the incorporated EDE files as a WAGO-external device. The device is first added to the database generically.
	[Cancel]	Closing of the dialog
-Override...	Importing of an Override file (WAGO device configuration file in XML format)	
-SymXML...	Creation of a WAGO device in the Import Pool based on a SYM_XML file	
-WAGO Database XML...	Importing of the WAGO database Entries in the database can be exported and re-imported as WAGO BACnet Database XML. This possibility existed because import and export using the EDE format does not include all data.	

Table 12: Menu Item Pool

Menu Item	Description
Export	
-EDE...	Exporting as EDE file if devices are present in the database

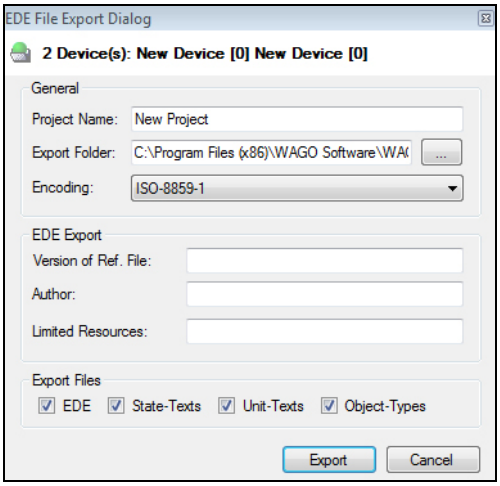


Figure 20: Exporting an EDE file

General	
-Project Name	Name of the project
-Export Folder	Folder in which the EDE files are stored
-Encoding	ISO-8895-1, ASCII or UTF8 character format
EDE Export	
-Version of Ref. File	Version of the project
-Author	Author of the project
-Limited Resources	Special limitations of the project that must be observed
Export Files	
-EDE	Information on the project, contained objects, descriptions, values and references to the State Text and Unit file
-State-Texts	Lists of states from State Text, Inactive Text and Active Text Properties of multistate or binary objects. Example: on/off, open/close. Reference numbers included refer to the EDE file.
-Unit-Texts	List of all BACnet Engineering Units and proprietary units of a project and the codes belonging to each of them
-Object-Types	List of supported BACnet objects; EDE file refers to this file
	Information **Additional Information** See also the definition of the EDE format at http://www.big-eu.org/service/software.php
[Export]	Exporting of EDE file(s)
[Cancel]	Abort settings
-WAGO Database XML..	Exporting of the WAGO Database to the selected folder

Table 12: Menu Item Pool

Menu Item	Description
Remove All Devices...	Delete all devices from the selected pool

4.2.1.5 Device

The menu item **Device** is used to configure devices as well as to backup, recover, import and export configuration data.
Depending on which pool the device is selected from, some of the subitems are enabled or disabled.

Table 13: Menu Item Device

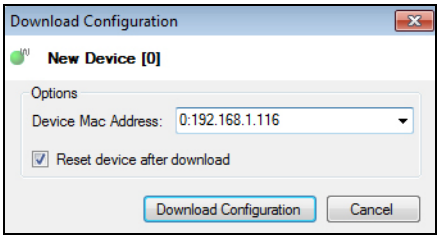
Menu Item	Description	
Configure...	Opening of the configuration area for a previously selected device (only in the “Browsing & Monitoring” tab)	
Close Configuration	Closing of the configuration for the selected device (only in the “Configure” tab)	
Download Configuration...	Downloading of the configuration  Figure 21: Downloading of the configuration	
	Options	
	-Device Mac Address	Network number followed by BACnet MAC address. The latter is an approximate IP address for BACnet/IP followed by a UDP Port Number (usually the symbolic value BAC0hex or 47808_{dez}). For BACnet/MSTP, the BACnet MAC address is a number within the range 0-255. Example: 192.168.1.180-BAC0
	-Reset device after download	Triggering of a restart after downloading the configuration
	[Download Configuration]	Load current configuration to the controller (only in the "Browsing & Monitoring" tab)
	[Cancel]	Abort/closing of the dialog

Table 13: Menu Item Device

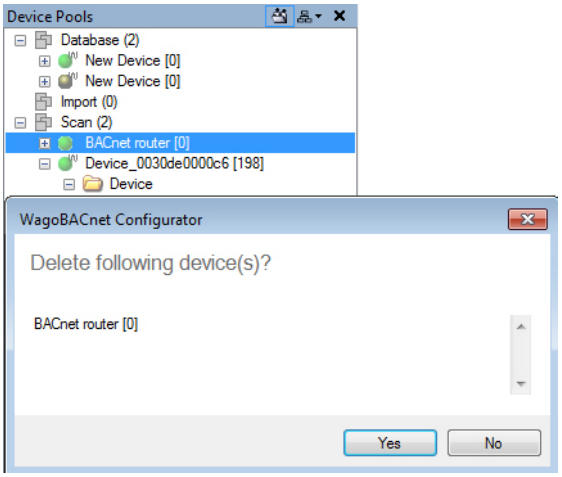
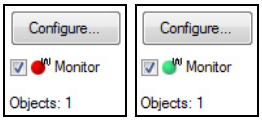
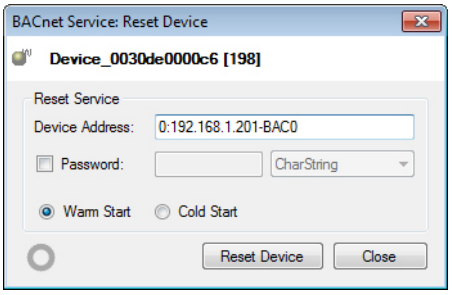
Menu Item	Description
Add/Store to Database	Storing the device in the database (“Add” when first entering the device, after that, “Store”)
Rescan selected Device(s)	Rescanning of a device (object list and properties)
Remove...	Removal of a selected device Several devices can be removed using multiple selection in the pool tab.  Figure 22: Delete device
Device Monitor	Devices are monitored using "Device Monitor" (if set). Switching the monitor on and off can also be done in the configuration area of the device.  Figure 23: Monitor devices
Services	
-Reset...	Restarting of each of the enabled devices and entering of an optional password for the Reset command.  Figure 24: Reset Device

Table 13: Menu Item Device

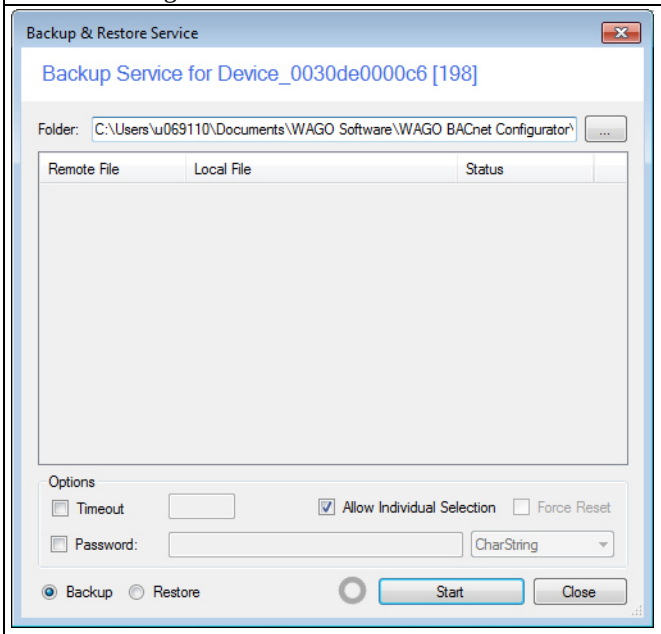
Menu Item	Description	
	Reset Service	
	-Device Address	BACnet MAC address of the device to be restarted
	-Password	If selected, entry of the password in the format CharString. The password is set in the configuration area “Configure”, registry “Communication”.
	-Warm/Cold Start	Software reset
	[Reset Device]	Triggering of a restart
	[Close]	Closing of the dialog without a device restart
	Note **Information about resetting the password!** To reset the password, open the configuration, select the device in the tree to the left, choose the “Communication” tab and enter a new password under “Security”. The new password is enabled after downloading and restarting.	
-Backup & Restore	**Backup** Create a backup of the configuration data of the selected device (timestamp to check for new configurations, override, SYM_XML, Persistent, NOVRAM, EEPROM, CODESYS data (without WebVisu) or other data such as PDF files). See Section “Backup and restore files” for a description. **Restore** Restoration of the configuration data of the device just selected	
	Note **Ensure that the configuration data is compatible for restoring!** Ensure that the configuration data is compatible when you use the “Restore” function. For example, do not use the configuration data for a 750-830 with a model 750-831.	
	 Figure 25: Backup and Restoration	

Table 13: Menu Item Device

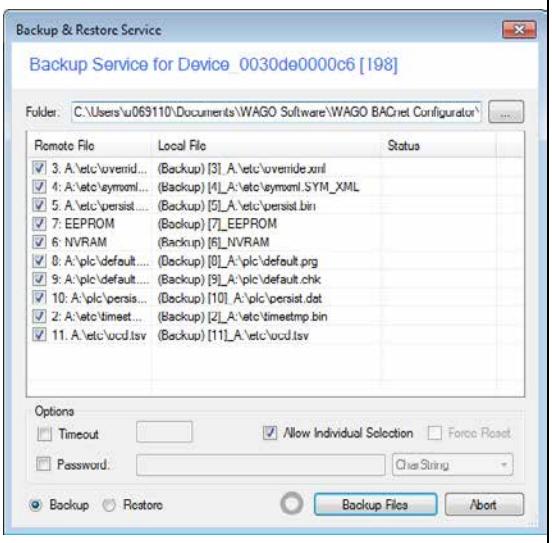
Menu Item	Description	
	Folder	Selection of the source/target folder, depending on whether a backup or restoration is being performed
	The remote and local file and the status of the backup/restoration appear in the display.	
	Options	
	-Timeout	Timeout (in seconds), which is written in the property “Backup_Failure_Timeout” as soon as Backup/Restore is executed. If the BACnet device receives no command belonging to a backup/restore procedure within this timeout, the device ends the backup/restore procedure
	-Password	Password in the format CharString. The password is set in the configuration area “Configure”, registry “Communication”.
	-Allow Individual Selection	Allows the selection of the file objects that can be backed up/restored (if checkbox set).
	-Force Reset	Restart of a device after a restoration
	Backup	Saving device data
	Restore	Restoration of device data
	[Backup Files]	Starting Backup or Restore  Figure 26: Backup Files Data is stored with a backup according to device name. If data is backed up, the Configurator searches for this exact name (caution in case of renaming).
	[Abort]	Closing of the dialog without changes
-Restore with…	Restoring the configuration data of the selected device (direct selection of wbr-file and thus simplified and faster restoration than backup and via the **Backup & Restore**) function.	

Table 13: Menu Item Device

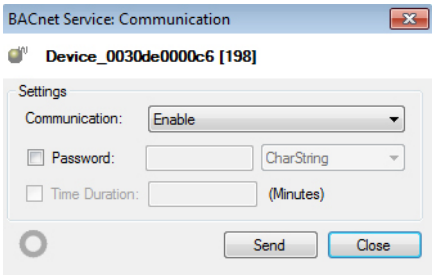
Menu Item	Description	
-Communication Control...	Opening of a dialog for configuration of BACnet services for the selected device  Figure 27: Service Settings	
	Settings	
	-Communi-cation	"Enable" (enabling of services), "Disable" (disabling of all services except for "Restart Device" and the communication service itself) and "Disable Initiation" (disabling of initialization)
		Note **Settings affect services supported by the BACnet Configurator!** Only those services that are used in the BACnet Configurator are affected by the settings. No other services supported by the BACnet/IP controller are altered.
	-Password	Entering of a password in the format CharString (if checkbox set) The password is set in the configuration area “Configure”, registry “Communication”.
	-Time Duration	Entering of the time, in minutes, for the disabling of services (only available if “Communication > Disable”) is chosen
	[Send]	Updating of the service settings
	[Close]	Discarding of changes since the last backup; closing of the dialog

Table 13: Menu Item Device

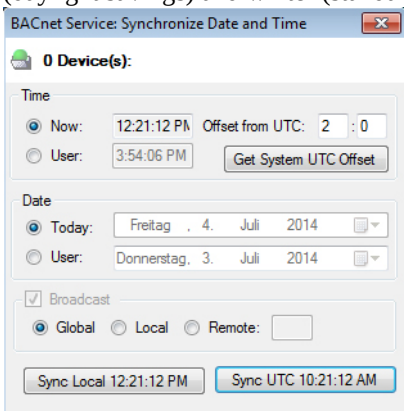
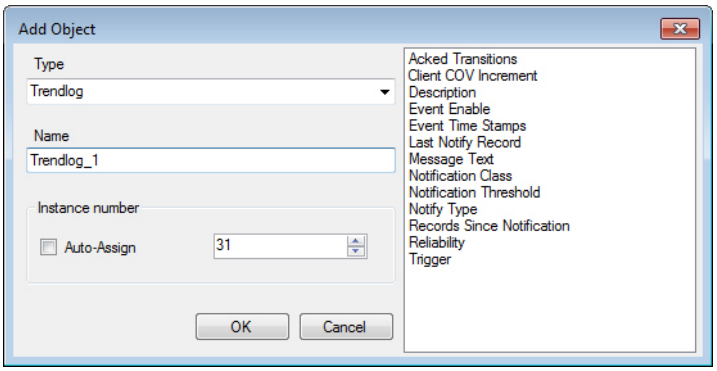
Menu Item	Description	
-Synchronize Time...	Opening a dialog for time synchronization of the devices In this dialog, the time offset in hours and minutes in relation to UTC time (Greenwich meridian), which is independent of summer (daylight savings) and winter (standard) time, is set.  Figure 28: Synchronize Time	
	Time	
	-Now	System time of the PC
	-User	Freely adjustable time
	-[Get System UTC Offset]	Automatic calculation of the time offset
	Date	
	-Today	Locally set date
	-User	Date of another user
	Broadcast	
	-Global	Sending of the request to all accessible subnetworks
	-Local	The request is only sent to the subnetwork to which the PC is connected
	-Remote	Network number 1-65534
	[Sync Local _ : _ : _]	Synchronizing of the device time with the PC time
	[Sync UTC _ : _ : _]	Synchronization of the device time with UTC time

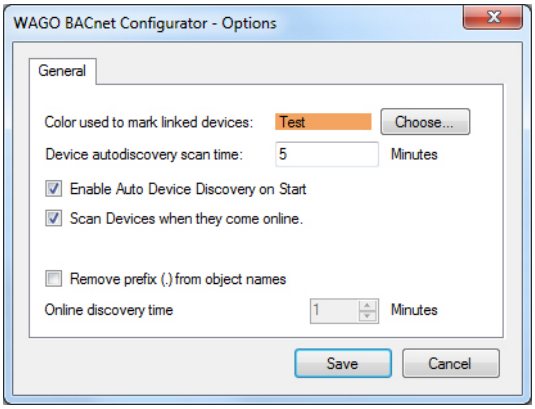
Table 13: Menu Item Device

Menu Item	Description	
-Add Object	Adding objects to the run time (possible trend log, schedule, calendar or file). The objects are created in the "Scan" pool.  Figure 29: Add Object	
	-Type	Selecting the object, which must be added at run time in the “Scan” pool
	-Name	Entering the object name
	Instance number	
	-Auto-Assign	Select this option if the instance number will be generated automatically or enter the instance number manually
	Selection field	
	Optional properties of the selected object are displayed in the selection field. In order to add properties, select these via a mouse click. Some selected properties are linked with others. These are added automatically.	
Import		
-Upload SymXML from Device...	Load SYM_XML file from the device	
-Load SymXML from File...	Opening of a SYM_XML file	
-Remove SymXML	Deletion of a SYM_XML file	
-Upload Override from Device…	Load the Override file from the device	
-Load Override from File...	Opening of an Override file	
-Remove Override	Deletion of the Override file	
Export		
-EDE...	Exporting of the EDE file; as soon as devices are available in the database, they can be exported as EDE files.	
-SYM_XML...	Export SYM_XML file	
-Override...	Export Override file	
-WAGO Database XML	Export WAGO database	
-Device Manager	Launch the “Device Manager” to manage and configure the devices contained in the database.	

4.2.1.6 Extras

The menu item **Extras** contains general setting possibilities in the BACnet Configurator.

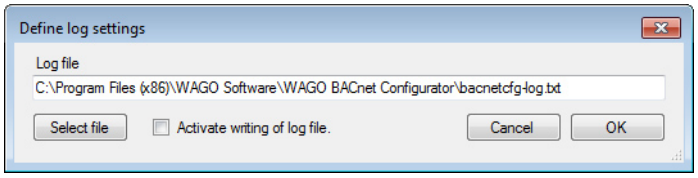
Table 14: Menu Item Extras

Menu Item	Description	
Options...	Opening of a new dialog for supplementary settings:  Figure 30: Supplementary Settings	
	General	
	-[Choose...]	Choosing of a color to mark a selected device within different pools
	-Minutes	The “Device autodiscovery scan time” refers to the function “Device Auto Discovery” (see section “ Toolbar”). It indicates the time interval, in minutes, for the automatic search of the network for new devices.
	-Enable Auto Device Discovery on Start	
		Choose this option to search for devices with every software start of the network.
	-Scan Devices when they come online	
		Devices and their configuration may have changed while offline. If this option is selected, devices that go from the offline to the online state will be rescanned.
	-Remove prefix (.) from object names	
		If this option is selected, the leading dot in object names is removed automatically.
	[Save]	Backup of settings
	[Cancel]	Abort/closing of the dialog
BACnet Settings	Open the "Cimetrics BACstac Gateway" dialog to configure the BACnet service (e.g. IP address, port, BBMD, "Foreign Device"). See also the chapter "Installing the BACnet Configurator and Service".	

4.2.1.7 Help

The menu item **Help** contains information on the BACnet Configurator itself.

Table 15: Menu Item Help

Menu Item	Description
About	Display of the version and copyright information
Show Readme-File	Open the Readme file that contains supplemental instructions, up-to-date information or changes in the software.
Support	Open the “Define log settings” dialog to save information to the log file. To save resources, the function should only be enabled as long as the information is needed.  Figure 31: Creating a Log File

Menu item	Description
-Log file	Path and name of the pre-selected last log file.
-[Select file]	Select a log file. Only change the name and path in an exception (the name “C:\Logfile.log” is not permitted, for example, depending on the operating system). Also make sure that the user has write access to the selected file.
-Activate writing of log file	Select this option to write data to the log file. Otherwise, no entries are created.
-[Chancel]	Discard the changes made and exit the dialog.
-[OK]	Accept the changes made and exit the dialog.

4.2.2 Toolbar

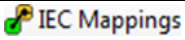
Table 16: Toolbar

Symbol/Function	Description
New Project	Creation of a new project
Open Project	Opening of a window to select a project file
Save	Saving of a project
Cut	Cutting selected objects or object properties
Copy	Copying of selected objects or object properties
Paste	Insertion of selected objects or object properties
BACnet-Scan	Searching the network for BACnet devices and listing of these devices in the Scan pool
Rescan Devices	Search object and property lists of the devices in the Scan pool again
Reset	Restart of the selected device
Backup & Restore	**Backup** Creation of a backup copy of all configuration data of a selected device. **Restore** Restoration of the configuration data of the device just selected.
Communication Control…	Opening of the dialog “Communication Service” for the selected device.
Synchronize Time	Opening a dialog for time synchronization of the devices.
View	Choose between the views “Device Pools” and/or "Structured View".
Download Configuration	Load current configuration to the controller (only in the “Browsing & Monitoring” tab).
Device Auto Discovery	Switching on and off of the automatic device recognition If automatic device recognition is enabled, new devices are searched for in a cyclical manner. Found devices are added to the Scan pool. The cycle time for the search is determined under “Extras” > “Options” (only available in the “Browsing & Monitoring” tab)
Monitor: Devices	Enabling and disabling of the Life-Monitor If Life-Monitor is enabled for properties, current property values of devices are read and displayed. The Life-Monitor for devices monitors whether a device is online or offline (only available in the “Browsing & Monitoring” tab)

If “Transaction Log” is enabled, the following buttons are also displayed:

Symbol	Function	Description
	Copy to Clipboard	Copying of the Transaction-Log onto the clipboard
	Clear Transaction Log	Deletion of all entries in the Transaction Log

If the “Configure” tab is opened, the following buttons are also displayed:

Symbol/Function	Description
	Opening of the non-modal “IEC Mapping Editors” (see section “Internal Mapping (IEC Mapping)”)
	Opening of the non-modal “Client Mapping Editors” (see section “**Fehler! Verweisquelle konnte nicht gefunden werden.**”)
Set persistence value	Store the value of the selected persistent object property in the override file.
Set all persistence values	Store the value of all persistent properties of the selected objects in the override file.

4.2.3 Views

The two views “Device Pools” and “Structured View” on the left side display the devices, objects and logical structuring of the BACnet/IP network.

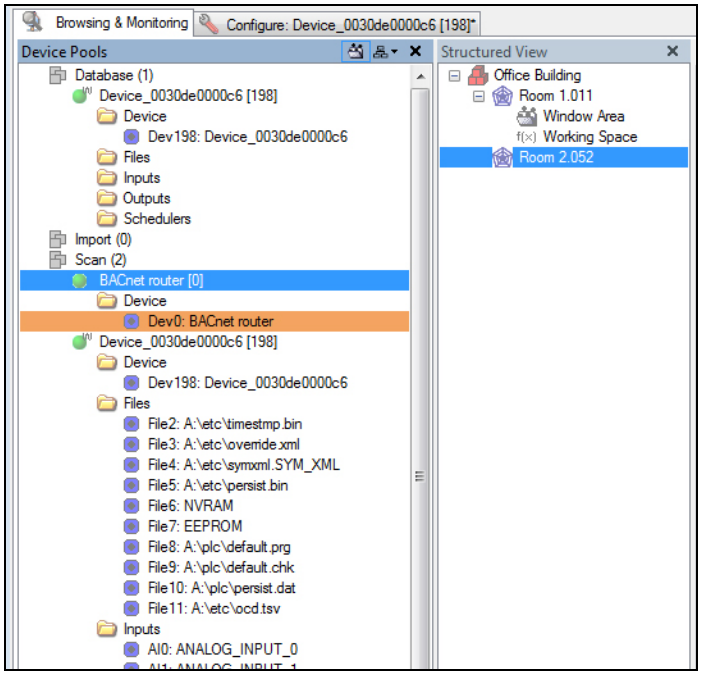


Figure 32: Views

If only the “Device Pools” are displayed, select “Structured View” as well in the main menu or in the toolbar under “View”.

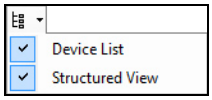


Figure 33: Changing the View via the Toolbar

The two views “Device Pools” and “Structured View” are explained in the following sections.

4.2.3.1 Device Pools

The Device Pools view displays the devices known to the BACnet Configurator in three different pools as a tree diagram.

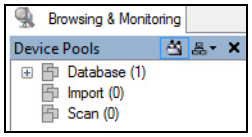


Figure 34: “Device Pools”

The Device Pools are the central contact point for the use of the BACnet Configurator. Each pool fulfills a special task:

Database Pool
The Database pool is the core piece of the BACnet Configurator. It represents all configurations and devices that are locally stored. This pool is persistent - the data it contains therefore remain, even after backup and subsequent ending of the program. All other pools, on the other hand, are transitory; their content is lost when the program is ended.
For WAGO devices, changes or expansions of the configuration can be done offline and downloaded into the device. In devices from other manufacturers, no offline change is provided for; here, only a “snapshot”, i.e. a momentary view of the device, is stored in the database.
Instance and device numbers of the devices in the Database pool must be unique. This is the prerequisite for a unique identification of the devices in BACnet networks (Identification).

Import Pool
The Import pool is used to import devices via EDE or WAGO database files. This pool, in contrast to the Scan and Database pools, has no limitation with regard to the uniqueness of the device instance numbers. No consistency tests are done since the Import pool is primarily intended for viewing device data. Imported devices are taken into the Database pool for further processing.

Scan Pool
Displays all devices that have been identified during a search of the network or by the automatic recognition of “Device Auto Discovery”.

The color code identifies the status of the device in the “Device Pool”.

Table 14: “Device Pool” – Color Codes

Color Code	Explanation
Green	The device has responded to a WHO-IS query on time.
Yellow	The device has not responded to a WHO-IS query, but the permitted response time has not been exceeded.
Red	The device has not responded to a WHO-IS query and the maximum response time has been exceeded. Cause: The device is no longer accessible or the device takes too long to report.

The color code of the device status may be delayed when scanning. In such case, the status of devices in the “Device Pool” is displayed, e.g., longer time, although they have already responded to the WHO-IS query and would therefore have to be green.

When using BACnet MS/TP devices, the following measures can be taken to shorten delayed response times:

- Setting the baud rate of the fieldbus
- Setting the “MaxInfoFrames” on the BACnet router

In both cases, increasing the values can improve response times.
In general, response times can be delayed when there are too many devices and MS/TP fieldbus utilization is too high.

Regardless of which pool a device or object is selected from, detailed information is displayed on the right side in the configuration area (see section “Configuration Area”).

4.2.3.2 Structured View

The Structured View represents the logical network construction in a tree structure of folders, subfolders and devices.

New folders are added by right clicking on an existing entry and selecting **Add Folder** in the context menu (see following Figure). The new folder is created beneath the selected entry.

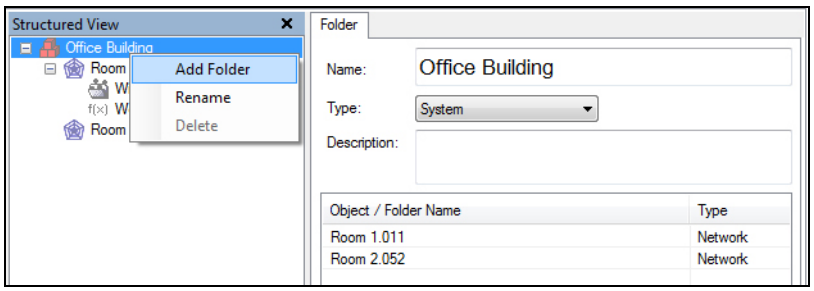


Figure 35: Adding Folders to the Structured View

The structure of the folders represents the typical construction of a building project (see following Figure). For instance, real estate, buildings, levels, and rooms all the way down to the devices can be mapped. The number of levels that can be used is unlimited.

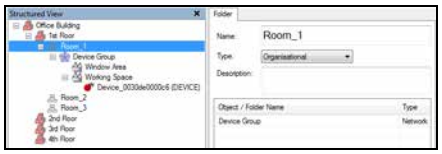


Figure 36: Structured View Register

Devices can be selected from the Database pool and moved to the Structured View by holding the mouse button down (see following Figure). In this way, devices are logically assigned, e.g. certain controllers for a work area. The device is not deleted from the Database pool by arranging it in the Structured View.

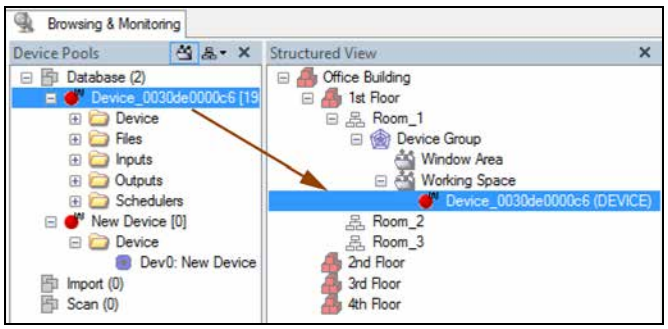


Figure 37: Incorporating objects in the Structured View

In the configuration area, you can change the name of the selected element and assign a type and a description.

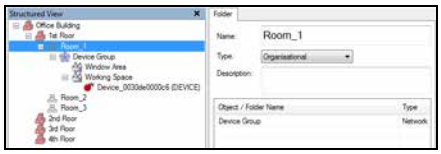


Figure 38: Structured View Register

Table 17: Structured View Register

Pool	Description
Name	Name of the selected element in the Structured View
Type	Type of element (e.g. network, system, device, data point)
Description	Description of the element
Object/Folder Name	Name of the groups/elements in which the element is found
Type	Type of groups/elements in which the element is found

Different objects of different devices can be logically assigned. This assignment can be done multiple times in order to assign objects to different logical categories, if applicable. The Structured View is saved and loaded together with the project.

Information

Additional Information

You can add devices or device objects from the Database pool to the Structured View. When you do this, the device object is treated like the device itself, i.e. adding the device object to the Structured View has the same effect as adding the device.

4.2.4 Configuration Area

In the configuration area, on the right side of the window, all configuration settings for WAGO BACnet/IP controllers can be undertaken (creation of objects, Client Mappings, etc.). The content of this area is dependent on whether the “Browsing & Monitoring” or “Configure” tab is opened. The “Browsing & Monitoring” tab is open by default, while the “Configure” tab is opened by right clicking on a device in the device pool.

In the view “Browsing & Monitoring”, the function of the right side of the area depends on which pool the just enabled device is selected from:

- In the Import pool, values can be viewed but not changed. The values are also not changed when Life-Monitor is enabled.
- In the Scan and Database pools, whether the monitoring of properties is enabled or not must be identified.
  - disabled – values that were current at the time of adding/updating are displayed. The device concerned is indicated with a gray dot.
  - enabled – current property values are displayed
    The device concerned is indicated with a green dot.

In the Configure tab, on the right side of the window, the configurations of the pools, devices and objects that you select in Device Pool or in the Structured View are displayed. If lists are displayed in the configuration area, you can go to the next deeper level by double clicking on an element of this list.

Example:
With a click on the Scan pool, the details of this pool and a list of the devices it contains are displayed on the right side. A double click on a device in the list then opens the device details with a list of the objects it contains. A double click on one of the objects opens the object configuration with a list of the object properties it contains.

Information

Additional Information
In the “Configure” tab, you can select several objects on the left in the tree. On the right, then, only the properties that are common to all the objects are still displayed. This then forms an “average” of all properties of the selected objects, and the property values can be easily set/altered for several objects.

In the following, the configuration area in the “Browsing & Monitoring” tab is described in relation to the selection of different pools, devices and objects (see sections “Pool”, “Device” and “Object”). Inside the description of the devices, the “Configure” tab can be opened with other (BBMD, Communication, IEC variables) tabs. In the “Configure” tab, additional information for the pools, devices and objects is sometimes displayed over against the “Browsing & Monitoring” tab.

4.2.4.1 Pool

By default, three Device Pools are displayed: “Scan”, “Import” and “Database”. The numbers in the brackets behind the respective pool indicate the number of devices contained.

With a right click on a pool, a context menu for additional settings will open (see following Figure). These correspond to the points in the main menu “Pool” (see section “Menu Bar” > “Pool”). In addition, all folders can be opened/closed and the “Device Manager” can be opened via **Expand/Collapse All** (see section “Device Manager”).

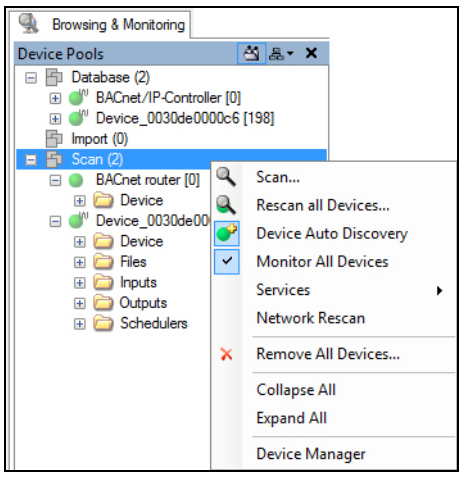


Figure 39: Pool context menu

When selecting a pool from the Device Pools, the configuration area for this pool opens on the right side.

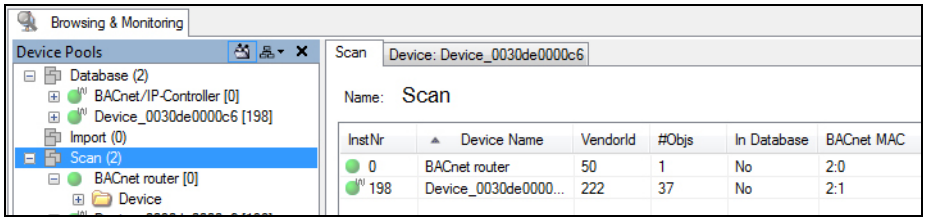


Figure 40: Configuration Area of the Pool

Table 18: Configuration area of the pool

Menu Item	Description
Name	Display of the pool name: “Scan”, “Import” or “Database”
List of devices contained	
-InstNr	Instance number of the device
-Device Name	Name of the devices within the pool
-VendorId	Manufacturer ID of the respective device
-#Objs	Number of objects in a device
-In Database	Indicates whether the device is present in the database
-BACnet MAC	Network number followed by BACnet MAC address. The latter is an approximate IP address for BACnet/IP followed by a UDP Port Number (usually the symbolic value BAC0hex or 47808dez). For BACnet/MSTP, the BACnet MAC address is a number within the range 0-255. Example: 192.168.1.20-BAC0

Click with the right mouse button on a device in the list and a context menu will open that contains the points from the main menu "Device" (see section “Menu Bar” > “Device”).

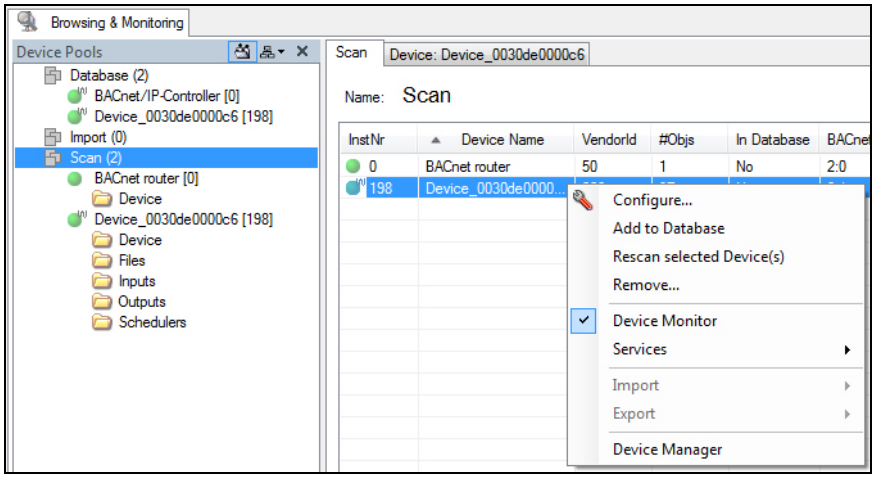


Figure 41: Context Menu of the Device

4.2.4.2 Device

One level below the pools, the devices are displayed.
The number in the brackets behind the respective device is the instance number of the device.

When a device in the pools Scan, Import or Database is selected, a tab with additional details opens on the right side.

The name, instance number, MAC address and description of the device as well as an overview of the objects it contains are displayed.

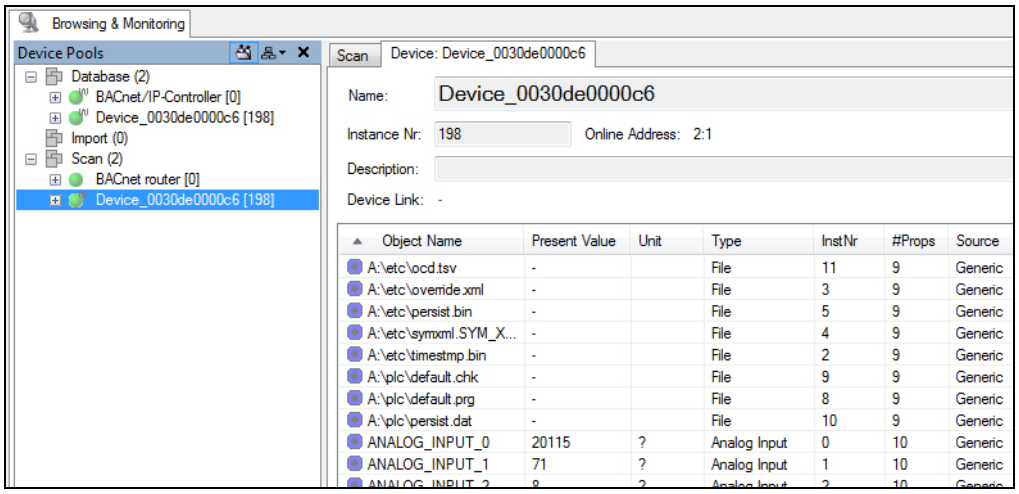
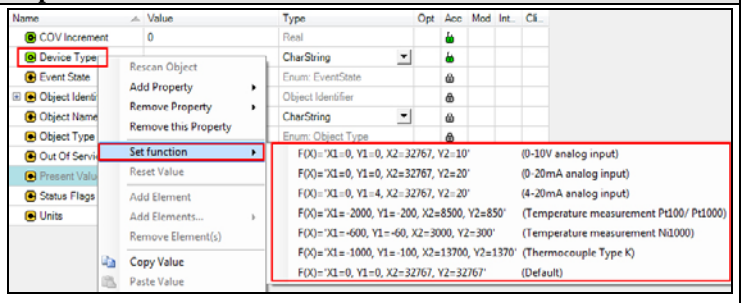

Browsing & Monitoring
Device Pools
Database (2)
BACnet/IP-Controller [0]
Device_0030de0000c6 [198]
Import (0)
Scan (2)
BACnet router [0]
Device_0030de0000c6 [198]
Scan
Device: Device_0030de0000c6
Name: Device_0030de0000c6
Instance Nr: 198
Online Address: 2:1
Description:
Device Link: -
Object Name | Present Value | Unit | Type | InstNr | #Props | Source
A:\etc\ocd.tsv | - | | File | 11 | 9 | Generic
A:\etc\override.xml | - | | File | 3 | 9 | Generic
A:\etc\persist.bin | - | | File | 5 | 9 | Generic
A:\etc\symxml.SYM_X... | - | | File | 4 | 9 | Generic
A:\etc\timestmp.bin | - | | File | 2 | 9 | Generic
A:\plc\default.chk | - | | File | 9 | 9 | Generic
A:\plc\default.prg | - | | File | 8 | 9 | Generic
A:\plc\persist.dat | - | | File | 10 | 9 | Generic
ANALOG_INPUT_0 | 20115 | ? | Analog Input | 0 | 10 | Generic
ANALOG_INPUT_1 | 71 | ? | Analog Input | 1 | 10 | Generic

Figure 42: Configuration Area of the Device

Table 19: Configuration area of the Device

Menu Item	**Description**
Name	Name of the device
Configure...	Opening of the device configuration (see section “Configuration of Device”)
Instance Nr.	Instance number of the device object by which the device is represented
Online Address	Network number followed by BACnet MAC address. The latter is an approximate IP address for BACnet/IP followed by a UDP Port Number (usually the symbolic value BAC0hex or 47808dez). For BACnet MS/TP, the BACnet MAC address is a number within the range 0-255. Example: 192.168.1.201-BAC0
Monitor	Enabled monitoring when the checkbox is checked; otherwise, disabled
Description	Description of the device
Objects	Number of objects contained in the unit
Device Link	Clickable link that exists whenever a configuration is opened for the device. Clicking on the link causes a change over to the configuration.
List of objects contained	
-Object Name	Name of the object, which can be freely chosen
-Present Value	Current value of the object
-Unit	The physical unit of the value of the Present_Value property of the analog object (value of the “Units” property). The process value of the “present value” can be scaled to a different range of values. The conversion is accomplished by a linear equation with upper and lower limit: **y= y1+ ((y2-y1) / (x2-x1)) * (x-x1)** **Scaling values:** 1. Add the property “Device Type” for an analog property via “Add Property”. 2. Select “Set function” in the “Device Type” context menu. 3. Select one of the predefined strings to scale the process value of the “Present Value” to a different value range.

Table 19: Configuration area of the Device

Menu Item	Description
	 Figure 43: Scaling Values Or: Enter the following string in the “Value” field: **F(X)=’X1=ab, Y1=cd, X2=ef, Y2=gh’**
	Example: A 0-10V bus terminal with a value range of 0-32764 must be displayed to the value range of 0 to 10 V: Select the entry **F(X)='X1 = 0; Y1 = 0'; X2 = 10; Y2 = 32767** from the “Set function” menu item or enter the values manually: **F(X)='X1=0, Y1=0, X2=10, Y2=32764'** as “Device Type” for the analog object.
	Note **The following must be observed in the scaling!** • Scaling can only be performed for analog input and output objects. • The values x1, y1, x2 and y2 are interpreted as REAL numbers. • For x and y use either uppercase or lowercase (not mixed). • Only the substring f(x) is evaluated. Additional text descriptions are possible. • A change in the scaling formula immediately affects the “Present Value”. • If a value overrun / value underrun should occur during scaling, the minimum or maximum value is generated. • Delete the entry to switch off the scaling.
-Type	Type of object, e.g. Device, Schedule, Analog Input
-InstNr	Instance number of the object assigned in the native operation of the system, which can otherwise be freely chosen Together with the object type, it identifies an object uniquely; in the case of the Device Object, the device is also uniquely identified.
	Note **Deleting instance numbers causes the property values transferred at runtime to be deleted!** By changing the instance number of an object, all persistent property values of the respective object will be deleted. From that point, the configured values will be used. Persistent property values are those values which you have loaded into the controller using the "Commit_Value" function.
-#Props	Number of object properties
-Source	Generic, native or SYM_XML-defined object

By clicking on the button **[Configure]**, the “Configure” tab for the selected device opens. This tab is also opened if **Configure** is chosen in the context menu of the device.

Inside the “Configure” tab, on the right side, four additional tabs are displayed that are described in more detail in the following sections:

- Device (see section “Device” > “Configuration of Device”)
- BBMD (see section “Device” > “Configuration of BBMD”)
- Communication (see section “Device” > “Configuration Communication”)
- IEC Variables (see section “Device” > “Configuration of IEC Variables”)

4.2.4.2.1 Configuration of Device

In the “Device” tab, the device to be configured is displayed on the left and the device information on the right (see following Figure).

In contrast to the view of the device in the “Browsing & Monitoring” tabs, additional information on the configuration and an import opportunity for the Override and SYM_XML files are displayed.

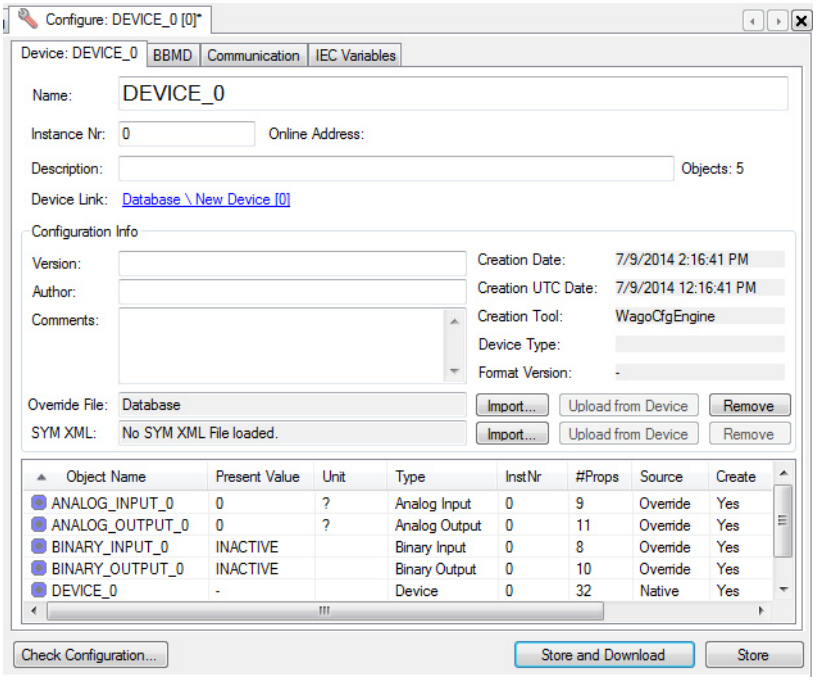


Figure 44: Configuration of Device, Configure View

Table 20: Configuration of Device, Configure View

Menu Item	Description
Name	Name of the device
Instance Nr.	Instance number of the device object by which the device is represented
Online Address	Network number followed by BACnet MAC address. The latter is an approximate IP address for BACnet/IP followed by a UDP Port Number (usually the symbolic value BAC0hex or 47808dez). For BACnet/MSTP, the BACnet MAC address is a number within the range 0-255. Example: 192.168.1.20-BACO
Description	Description of the device
Device Link	Clickable link which, when clicked, refers either to the database entry (if present) or the Scan entry of the device, depending on where the device is located.
Configuration Info	
-Version	Version of the configuration
-Author	Author
-Comments	Comment
-Creation Date	Creation date in the format dd\mm\jjjj hh:mm:ss (AM (**A**ntes **M**eridiem), PM (**P**ost **M**eridiem)
-Creation UTC Date	UTC creation date in the format dd\mm\jjjj hh:mm:ss PM
-Creation Tool	Creation tool

Table 20: Configuration of Device, Configure View

Menu Item	Description	
-Device Type	Device type (model identification “750-8xx”); is filed in the Device Object in a similar manner as for the property “Model_Name”.	
-Format Version	Format version of the Override file	
Override File	**[Import...]**	Opening of a file browser for selecting an Override file
	[Upload from Device]	Loading of an Override file from the device
	[Remove]	Deletion of the Override file being used
SYM XML	**[Import...]**	Opening of a file browser to select a SYM_XML file
	[Upload from Device]	Loading of a SYM_XML file from the device
	[Remove]	Deletion of the SYM_XML file being used
List of objects contained		
-Object Name	Name of the object, which can be freely chosen	
-Present Value	Current value of the object	
-Unit	The physical unit of the value of the Present_Value property of the analog object (value of the “Units” property)	
-Type	Type of object, e.g. Device, Schedule, Analog Input	
-InstNr	Instance number of the object; assigned in the native operation of the system, which can otherwise be freely chosen; together with the object type, it identifies an object uniquely; in the case of the Device Object, the device is also uniquely identified.	
-#Props	Number of object properties	
-Source	Generic, native or SYM_XML-defined object	
-Create	This flag indicates whether the object has been created or not. It is primarily intended to prevent the creation of native objects. By default, all objects are created.	
-SubCOV	This flag indicates whether the object accepts COV subscriptions for the Present_Value (by default and recommendation “Yes”).	
-SubCOVProp	This flag indicates whether the object accepts COV subscriptions for any properties of an object (by default, yes). Recommendation: if there is a lack of resources in the controller, set this flag to “No”.	
-Intr	This flag indicates whether the object supports alarming (Intrinsic Reporting).	

By right clicking on the device, you will obtain a context menu with the possibility of adding objects via **Add Object** (see following Figure), or to delete them via **Delete Object(s)**.

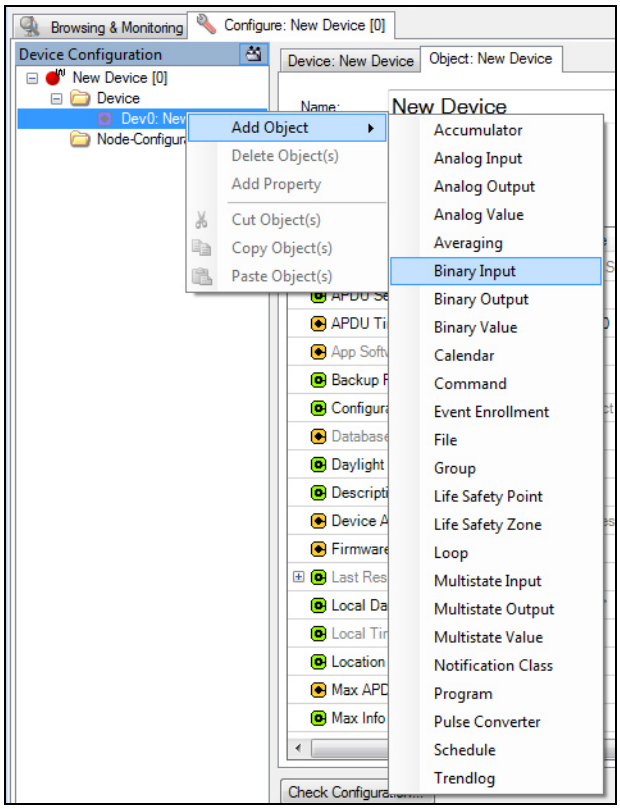


Figure 45: Object Context Menu

As soon as you have selected the device with the mouse, a new register, “Object: <Object name>” for object configuration is displayed (see section “Configuration Area” > “Object”).

4.2.4.2.2 Configuration of BBMD

In the “BBMD” tab, the BACnet Broadcast Management Device is parameterized. A BBMD enables the sending of BACnet Broadcast Reports over IP routers to other networks. Each of the networks to which the broadcasts are forwarded and from which broadcasts are received must also have a BBMD.

BBMDs also forward broadcasts to external devices, so-called Foreign De-vices (FD). FDs are BACnet devices external to the network that report directly to a BBMD in order to receive broadcasts.

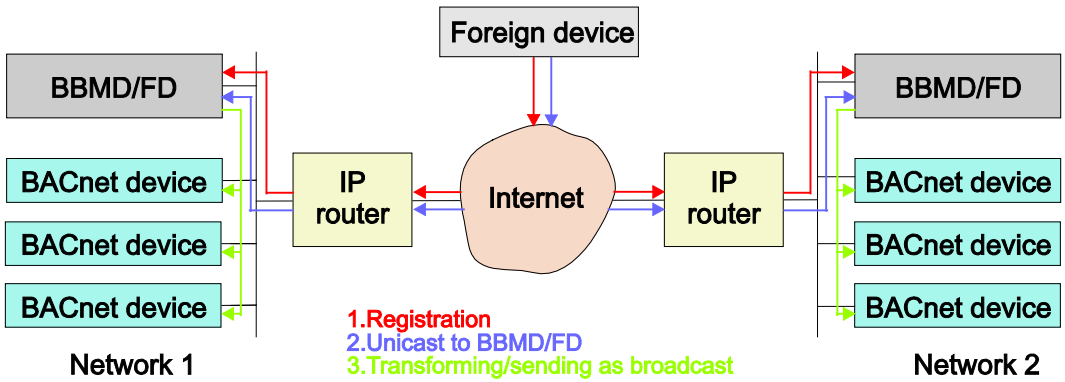


Figure: 46: Broadcast via BBMD

You can permit the logging on of FDs to a controller by selecting **Allow Foreign Devices** or block foreign devices by disabling the checkbox.

Each BBMD has a Broadcast Distribution Table (BDT) containing the BACnet MAC addresses of BBMDs to which the broadcasts are forwarded. You can edit the BDT (see following Figure).

Note

Include own BBMD in BDT!
For correct operation of the BBMD in IP subnets, be sure to enter your own device (broadcast mask 255.255.255.255) into the Broadcast Distribution Table (BDT). Therefore, a BDT with active BBMD always contains at least two entries: the own BBMD with an own IP address and the BBMD of the other network. BBMD functions that are only related to external devices (on the local IP net) are also available without entering the own device

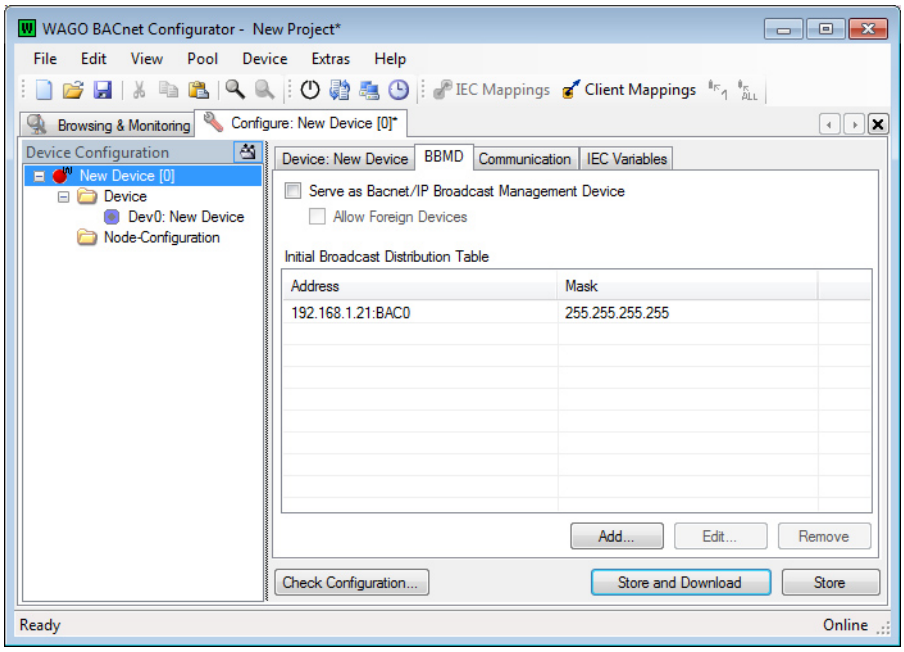


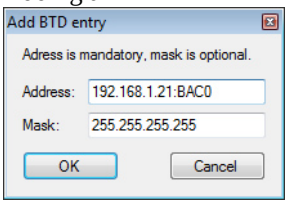
Figure 47: Configuration of “BBMD”

The following points can be adjusted if Serve as **BACnet/IP Broadcast Management Device** is selected.

Table 21: Configuration “BBMD”

Menu Item	Description
Serve as BACnet/IP Broadcast Management Device	Enables/disables BBMD functionality. Prerequisite for all settings in this tab.
Allow Foreign Devices	Choose whenever foreign devices are to be allowed in the network to communicate with the selected device
List of BBMDs	
Address	BACnet MAC address of a BBMD (IP address + UPD Port Number)

Table 21: Configuration “BBMD”

Menu Item	Description
Mask	**Note** **Observe settings for broadcasts!** “Directed broadcasts” are usually not possible since these are often blocked by IP routers. It is therefore recommended that you use two-hop forwarding and set broadcast mask 255.255.255.255.
[Add...]	Adding a BBMD  Figure 48: Adding a BBMD
	Address Entering the IP address (necessary)
	Mask Entering the net mask (optional)
	[OK] Incorporation of the BBMD in the BDT
	[Cancel] Abort/closing of the dialog
[Edit]	Alteration of certain entries.
[Remove]	Deletion of the BBMD Selection of several entries by holding down the shift key.

[Add], **[Edit]** and **[Remove]** can also be reached through the context menu.

4.2.4.2.3 Configuration of Communication

In this tab, system-specific settings for IP/MS/TP and security settings are undertaken. The controller first runs with standard settings that can be called up in the web-based management system of the controller. Changes to IP/MS/TP settings in the BACnet Configurator are enabled as soon as **[Store and Download]** is clicked and the BACnet device is restarted.

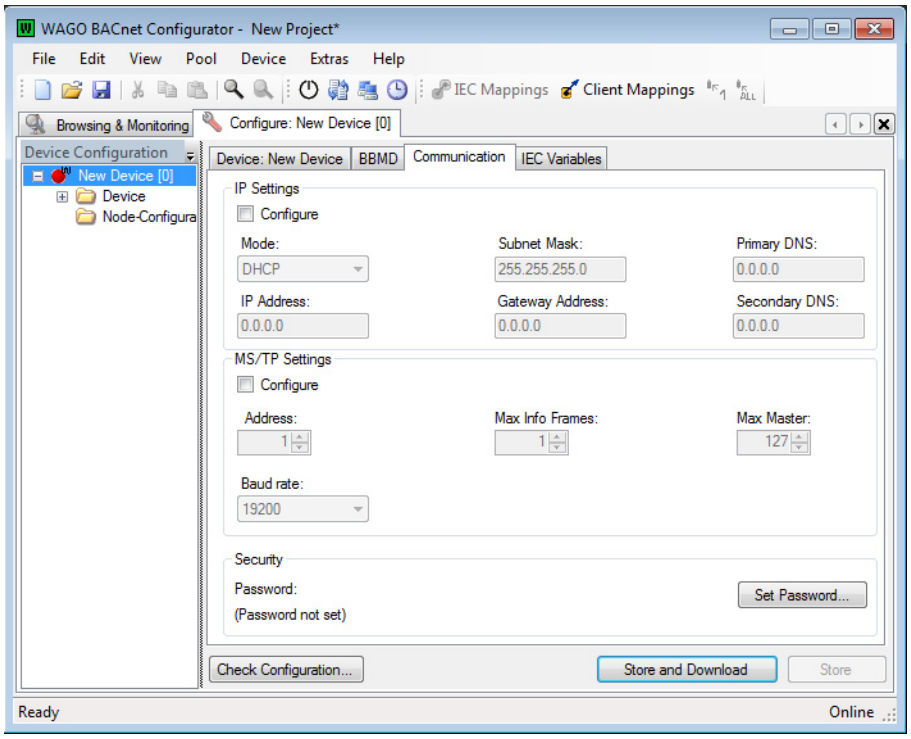
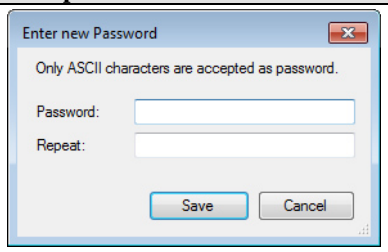


Figure 49: Configuration of Communication

Table 22: Configuration of Communication

Menu Item	Description
IP Settings	
Configure	Use the following IP settings
-Mode	DHCP or static; If no value is set, the controller runs with the parameters set in the firmware.
-IP Address	IP address of the device
-Subnet Mask	Subnet mask of the device
-Gateway Address	Gateway address of the device
-Primary DNS	First Domain Name System
-Secondary DNS	Second Domain Name System
MS/TP Settings	
-Configure	Use the following MS/TP settings
-Address	Device address
-Max Info Frames	Maximum number of Info frames
-Max Master	Maximum number of masters in the network
-Baud rate	Transmission speed
Security	
-Password	Password for changing the configuration All access restrictions in the BACnet Configurator use the same password. By default, no password is set.
	[Set Password...] Opening of a dialog for assigning a password

Table 22: Configuration of Communication

Menu Item	Description	
	 Figure 50: Setting a Password	
	Password	Entering a password
	Repeat	Repeating the password
	[Save]	Saving the password
	[Cancel]	Cancellation of the password assignment

Note

Network number entry not necessary for WAGO BACnet Controllers!
A BACnet network number is used to enable a BACnet router to forward messages from one BACnet network to another. The network number is not used for communication between devices in the same network. The network numbers of devices from other networks are automatically identified by the WAGO BACnet Controller and used for communication. For this reason, the network number cannot be set on WAGO BACnet controllers. This only has to be set on the BACnet router used.

4.2.4.2.4 Configuration of IEC Variables

In this tab, the BACnet Configurator lists all IEC variables known from a SYM_XML file (see following Figure).

A SYM_XML file is created using the software WAGO-I/O-*PRO*.

1. In the WAGO-I/O-*PRO* software under **Project\Options** select the category **Symbol Configuration**.

2. Place a check mark in the control field **Generate XML symbol table**.

3. Click on the button **[Configure symbol file...]**.

4. Place a check mark in the check box **Issue object variables.**

Once these options have been activated, an SYM_XML file will be generated automatically with project variables when a project is compiled.

5. Place a checkmark in the check box **export collective entries**, so that the values of the unit is also created in the SYM_XML.

Note

If possible, only enable the top two check boxes!
If possible, only enable the top two check boxes **export variables of the object** and **export collective entries**.
When selecting additional options, a download may not be made on the BACnet/IP controller due to the file size.

Note

Disable simulation mode in WAGO-I/O-*PRO*!
If the WAGO-I/O-*PRO* software is in simulation mode, no SYM_XML file can be created.

The created SYM_XML file is imported in the BACnet Configurator along with the IEC variables. Here, two types of variables are differentiated.

1 IEC variables that are permanently linked with a property of a BACnet object as per SYM_XML: These variables cannot be linked to anything else.

2 IEC variables that are not assigned to any object property by the SYM_XML: These variables can be assigned to properties in objects with the BACnet Configurator. In this case, an IEC variable can be mapped directly onto a BACnet property.

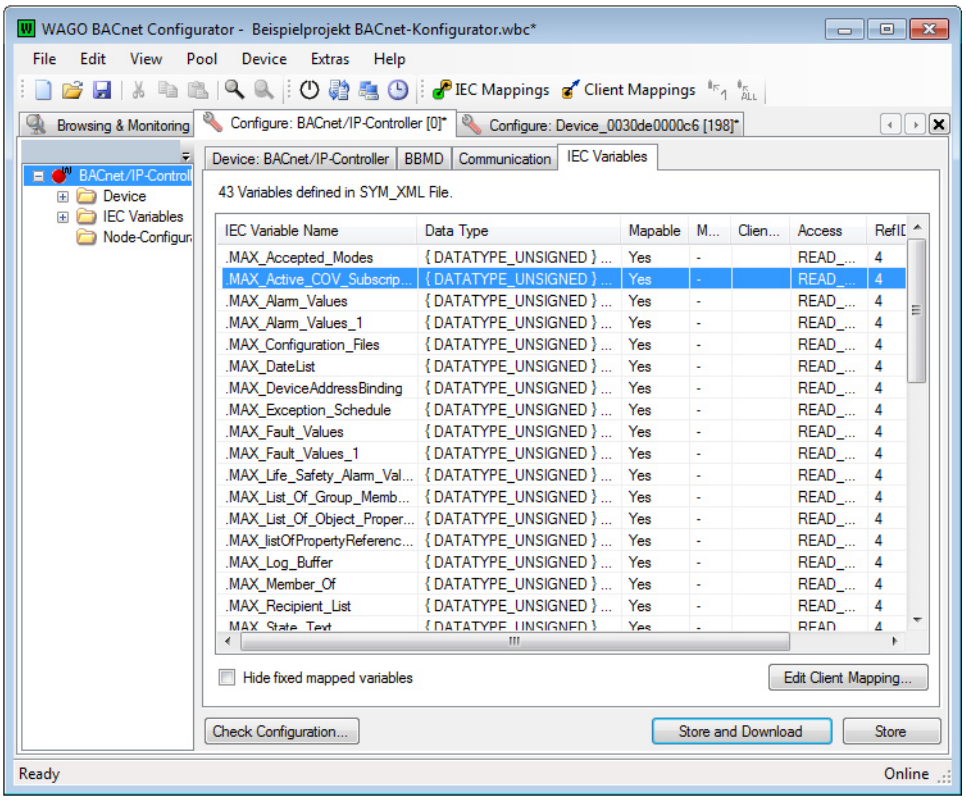
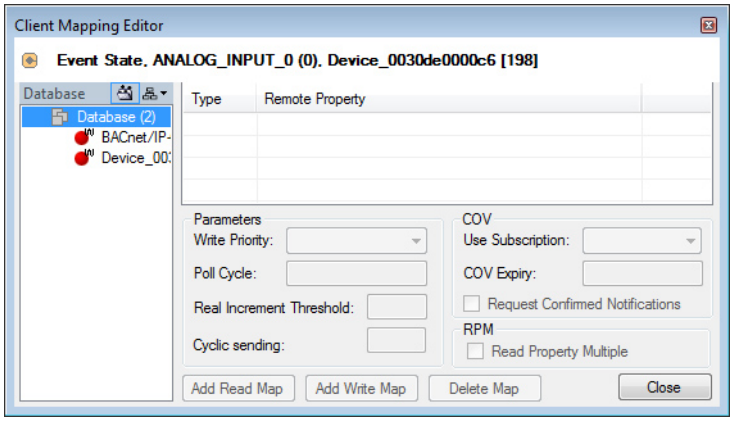


Figure 51: Configuration of IEC Variables

Table 23: Configuration of IEC Variables

Menu Item	Description
IEC Variable Name	Name of the IEC variable
Data Type	Data type of the IEC variable
Mapable	IEC variable can be linked with BACnet property - Yes/No
Mapped to Property	BACnet property is linked with the one IEC variable
Client Mappings	BACnet property is linked with the one other BACnet property
Access	Access mode
RefID	Values from the SYM_XML file; Location of the 61131-variables in the firmware
Offset	
Hide fixed mapped variables	Masking/unmasking of fixed mapped, no longer linkable variables
[Edit Client Mapping...]	Opening of a non-modal dialog through which BACnet properties can be assigned to other BACnet properties. Those properties on which the already active IEC variable can be mapped or on which it is mapped are displayed. Changes to “client mapping” can be made over two dialogues - via the “Client Mapping Editor” (see the figure below) or via the registry “client mapping” integrated in the “Device Manager”. Both dialogs are functionally identical, however, default settings can also be saved within the “Device Manager”. See section “Client Mapping” for the description of the dialogs.  Figure 52: Client Mapping Editor

The Client Mapping Editor can also be reached through the context menu.

4.2.4.2.5 Node-Configurator

The “Node-Configuration” is used to add or remove native I/O modules at one position or any position within a node.

The “Node-Configuration” folder is in the “Configure” tab under the object folder. The input and output channels of the I/O modules are read by scanning and displayed in the “Node Configuration” folder as BACnet objects. The object instance number for each channel type is assigned starting with the first I/O module. If new I/O modules are added within the node, the numbers are assigned again. The respective BACnet objects (defined in the “terminal.csv” file) are created again or taken from the group of available (unassigned) objects and assigned.

If there are any free objects, the user is asked if they should be added. Missing objects are automatically created again.

The “Node-Configuration” folder is accessed from the context menu.

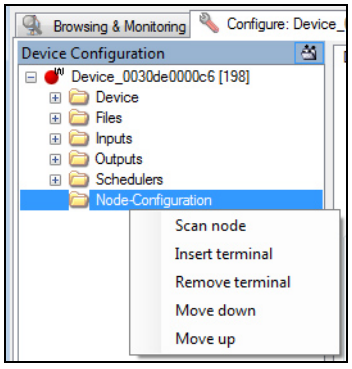
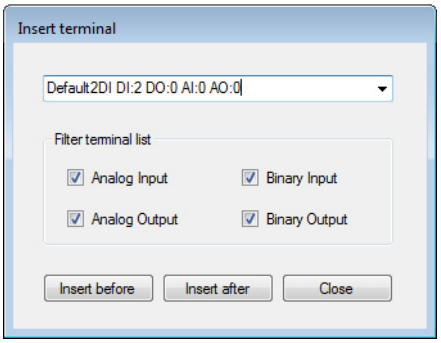


Figure 53: “Node Configuration” Context Menu

Table 24: Node-Configuration

Menu item	Description	
Scan node	Scan the node. Any I/O modules found are displayed in the “Node Configuration” folder.	
Insert terminal	Manually insert I/O module  Figure 54: Insert Terminal The I/O module information is read from the “terminal.csv” file and displayed in the selection box.	
	Filter terminal list	Enable/disable analog/digital inputs/outputs for filtering the I/O modules in the selection box.
	[Insert before]	Insert I/O module before the I/O module selected in the “Node Configurator”.
	[Insert after]	Insert I/O module after the I/O module selected in the “Node Configurator”.
	[Close]	Close the dialog.
Remove terminal	Remove I/O module. The I/O modules can be deleted (recalculation of the remaining hardware instance IDs of the remaining native objects) or moved to the area of the free BACnet objects.	
Move down/up	Move I/O module down/up. The assigned BACnet objects are also moved. The hardware instance IDs are reassigned according to the position of the I/O module in the configuration.	

The node configuration is saved with project information in the project file (*.wbc).

4.2.4.2.6 Storing and Downloading a Valid Configuration

The button **[Check Configuration]** to test the configuration is displayed on the bottom left of the configuration area.

Figure 55: Check for a Valid Configuration

Click the button to display any warnings.

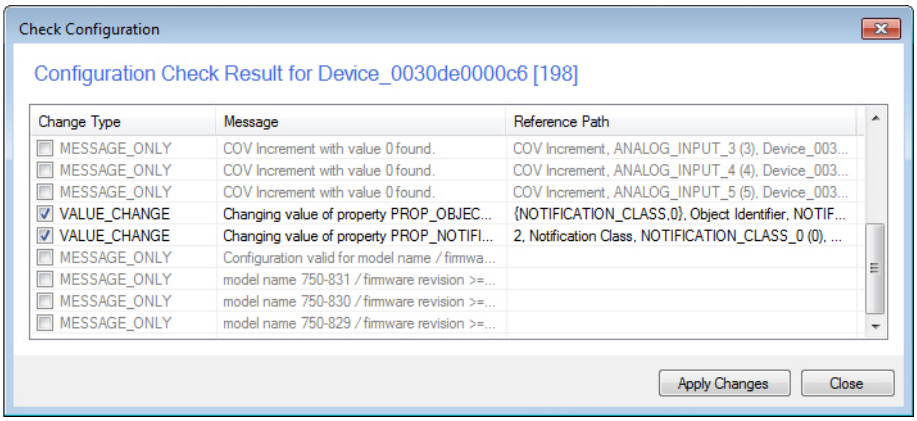


Figure 56: Displaying Warnings

If the configuration is valid, no warnings are displayed. You can close the window.

If warnings are present, place a checkmark in the check box in front of the warning, if you want to apply the respective changes, despite the warning. Remove the check mark if you don't want to make the relevant change. In this case, the property is reset to a valid value.

Table 25: Checkbox

Menu Item	Description
[Apply Changes]	Accept the changes (if checkbox set) or reset the change (if checkbox not set)
[Close]	Closing the dialog

A device configuration is only downloaded if there is a valid configuration for the selected fieldbus controller.
Otherwise, a list of fieldbus controllers and related firmware revisions is displayed that support the current device configuration.

At bottom right in the configuration area the buttons **[Store and Download]** and **[Store]** are shown.

Figure 57: Storing and Downloading Settings

Table 26: Configuration Area

Menu Item	Description
[Store and Download]	Accepting the changes; adding the configuration of the device(s) to the database if not yet present in the database; downloading the new configuration to the device
[Store]	Accepting changes; adding the configuration of the device(s) to the database if not yet present in the database

The buttons **[Check Configuration…]**, **[Store and Download]** and **[Store]** refer to the entire configuration, i.e. to all settings in the “Device”, “BBMD”, “Communication” and “IEC Variables” tabs.

4.2.4.3 Object

Following the description of the pool and device configuration, this section describes the configuration area for objects.

Objects are arranged in the “Device Pools” one level below the devices and are managed in their own folders depending on the type of object (for example, an Analog Input Object in the “Inputs” folder). The number in the brackets behind the respective object is the instance number of the object.

By right clicking on an object in both Scan pool and **Rescan Object(s)**, the selected object is imported again. Several objects can be selected and scanned by holding the control key down.

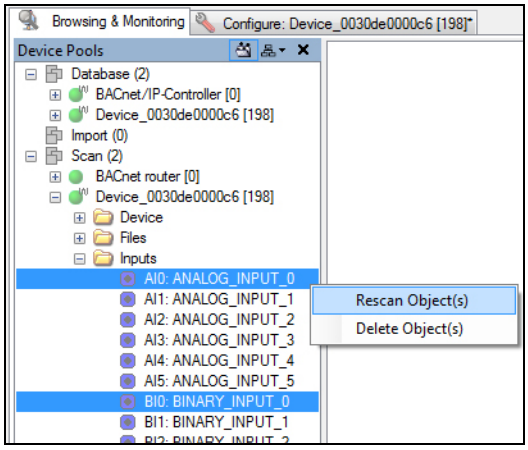


Figure 58: Scanning again one or several Objects in Scan Pool

If you click on an object in the Device Pool, a new “Object<Object Name>” register with a list of all associated object properties opens in the configuration area to the right. The following symbols are displayed before the property names and values.

Table 27: Symbols for required/optional properties and monitoring

Symbols	Description
	The property required for the respective object by the BACnet Standard
	Optional object properties
	Optional sub-element of a property is activated (can be changed by clicking on symbol)
	Optional sub-element is activated (can be changed by clicking on symbol)
	Enabled monitoring
	Current value of the device varies from the currently configured value.

The configuration area of the graphic interface varies, depending on the selection of “Configure” or “Browsing & Monitoring” tabs (see following Figures).

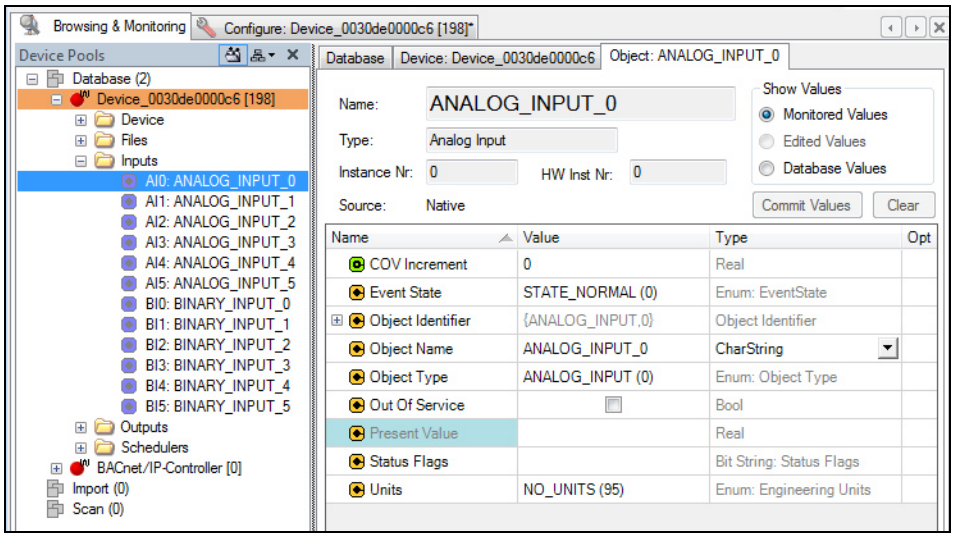


Figure 59: Configuration of “Object”, View in the “Browsing & Monitoring” Tabs

Object view in the “Browsing & Monitoring” tab:

Table 28: Object view in the “Browsing & Monitoring” tabs:

Menu Item	Description
Name	Name of the object
Type	Type of the object
Instance Nr	Instance number of the object
HW Inst Nr	The hardware instance number indicates the sequence of in-put/output channels for analog and digital input/output objects (display for input/output objects in both "Browsing & Monitoring" tabs database pool and "Configure" tabs)
Source	Type of the object (native, SYM_XML, Override, generic)
Show Values	
-Monitored Values	Display of current values
-Edited Values	Display of altered values
-Database Values	Display of values that are saved in the database (Display in database pool, "Browsing & Monitoring" tabs)
[Commit Values]	Transmission of altered values to the controller Changed properties are highlighted in color: **green** Property has been successfully changed and transmitted **yellow** Changed property has not been transmitted yet (monitor mode)

Table 28: Object view in the “Browsing & Monitoring” tabs:

Menu Item	Description
	orange Changed property has not been transmitted yet (editing mode) **red** Change has failed **blue** Present_Value
	Note **Use “Commit Values” for Changes during run-time!** With the “Commit Values” function, you can change the BACnet object property values quickly and load them into the controller without configuration during runtime. The values will be persistently stored in the flash memory and overwrite existing configuration values. Requirements for value changes using “Commit Values”: Access to the object property is permitted (identified by the symbol in the “Configure” tab). You can delete persistent values again in three different ways: 1 Delete the object containing the persistent data and load your configuration into the controller without this object. Then create a new object with standard values. 2 Change the object instance number and load your configuration into the controller. From that point, **all** property values of this object are assumed from your configuration (“Configure” tab). 3 Change the specific object property values in the “Configure” tab and download the configuration into the controller. From that point, **these** values (identified by the symbol in the “Configure” tab) will be taken over from your configuration.
[Clear]	Cancels changes and deletes colored markings
List of object properties	
-Name	Name of the property
-Value	Value of the property
-Type	BACnet data type of the property
-Opt	There are required and optional fields for structured data types. An icon in this column indicates whether the optional field is available. By clicking on the icon, you can alternate between the states “Field is available” and “Field is not available”.
-Priority	Display of the write priority
-Status	Display of the transmission status

When selecting **Configure** in the context menu of a device, the “Configure:<Device Name>” tabs opens. If you click on a device in the tree, the configuration area containing additional options (cf. last with following Figure) opens on the right side.

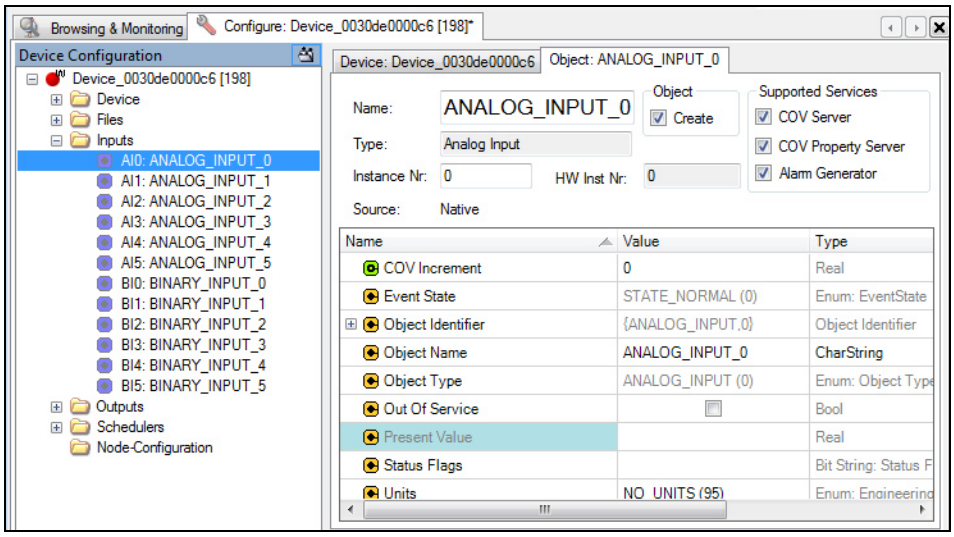


Figure 60: Configuration of “Object", View in the “Configure” Tabs

Additional options in the “Configure” tab

Table 29: Additional Options in the “Configure” Tab

Menu Item	Description
Object	
-Create	This flag indicates whether the object has been created or not. It is primarily intended to prevent the creation of native objects. By default, all objects are created.
Supported Services	
-COV Server	Indicates whether the object accepts COV subscriptions for the Present_Value (by default and recommendation: select)
-COV Property Server	Indicates whether the object accepts COV subscriptions for any properties of an object (by default, “Yes”)
-Alarm Generator	Enabling/disabling of object alarming (“Intrinsic Reporting”)
List of object properties	
-Acc	Display of the possibility of access (“Access”) to properties via a lock symbol:
	Access allowed (can be changed by clicking on symbol)
	No access allowed (can be changed by clicking on symbol)
	Access allowed (cannot be changed since required by BACnet Standard)
	No access allowed (cannot be changed since required by BACnet Standard)
-Mod	In the “Mod” (“Modified”) column, changed standard/default values are marked with an arrow. Configuration values that are imported as EDE files also receive a marking.
	The property has been changed or been newly added (green).
	By clicking on the arrow, the previous value can be restored (toggling between the initial and configuration value).
	Note **Note the interaction between configured values and the values modified at runtime!** If the arrow is set, the values from the configuration are used and will over-write the runtime values that were transferred using "Commit Values". If no arrow is set, the runtime values for the corresponding property are also retained after the configuration is written.
	The property has been changed but cannot be reset (gray)
-Internal Mappings	Display of the IEC variable on which the property is mapped. Clicking on a field in the column “Internal Mappings” opens the “IEC Mapping Editor” (see section “Internal Mapping (IEC Mapping)”).
-Client Mappings	Indicates whether there is a “Client Mapping” for the given variable or not. Clicking on a field in the column “Client Mappings” opens the “Client Mapping Editor” (see section “**Fehler! Verweisquelle konnte nicht gefunden werden.**”).

Right clicking on the list of object properties will give you a context menu.

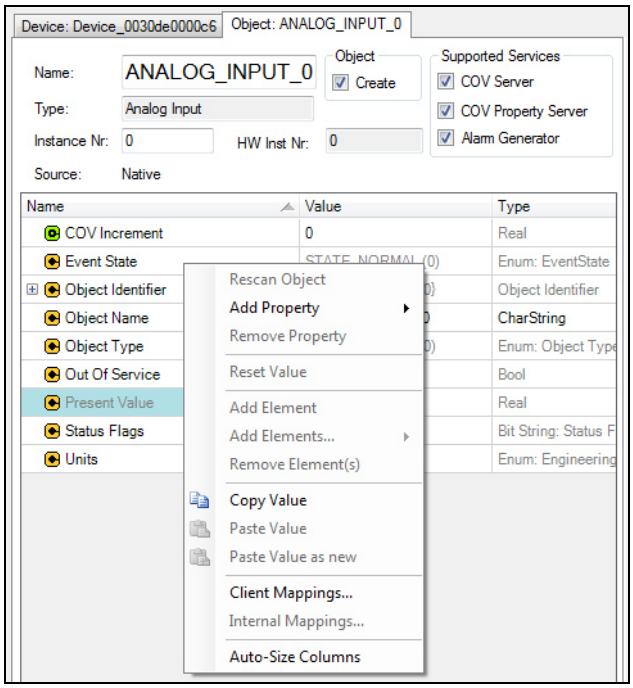


Figure 61: Properties Context Menu

The context menu will give you the following selection possibilities:

Table 30: Selection possibilities

Menu Item	Description
Rescan Object	Updating the object
Expand All	Expansion of all folders
Collapse All	Collapse of all folders
Add Property	Addition of a valid object property
Remove Property	Removal of an optional property
Reset Value	Resetting of a property value to the default value
Add Element	Addition of an element or field if the property is a field or a list
Add Elements...	Insertion of several elements; otherwise, like “Add Element”
Remove Element(s)	Removal of an element
Copy Value	Copying of a property value
Paste Value	Insertion (replacement) of a property value
Paste Value as new	Add a new list element with the copied value (e.g. with the property “Data List” of the Calendar Object)
Client Mappings...	Opening of the “Client Mapping Editors” (see section “Client Mapping”).
Internal Mappings...	Opening of the “IEC Mapping Editors” (see section “Internal Mapping (IEC Mapping)”)
Auto-Size Column Widths	Automatic setting of the optimal column width

4.2.5 Device Manager

The “Device Manager” is used to easily manage and configure multiple devices at the table basis.

The “Device Manager” is opened via the context menu of the “Device Pools” “Database”, “Import” or “Scan”.

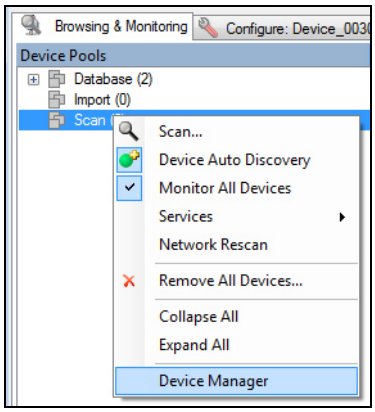


Figure 62: Open “Device Manager”

Existing devices are displayed in a tree structure.
The “Device Manager” provides an additional perspective of the devices of the database. Only units contained in the database can be configured with the “Device Manager”.

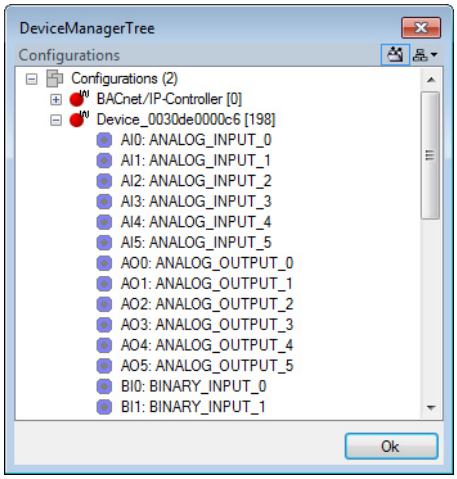


Figure 63: Tree Structure in the “Device Manager”

In order to open the “Device Manager” for a selection of devices/objects, one or several devices or one or several objects are selected (by pressing the Shift key) and confirmed with **[OK]**. A device or an object can also be opened directly by double-clicking the device or object.

4 registries are displayed, which are described in the following chapters.

4.2.5.1 Object Manager

The “Object Manager” portrays objects in a table view. Values can be assigned to the object properties. Existing properties can be changed.

The list of objects can also be used for processing with other programs, such as exporting and importing MS-Excel as a CSV file.

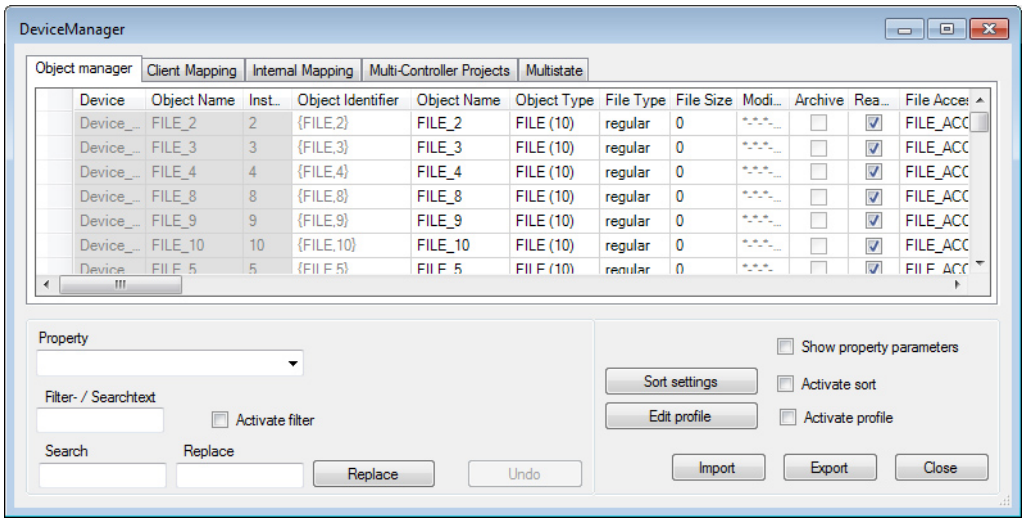


Figure 64: “Object Manager”

Table 31: Context Menu Selection Options

Menu item	Description
List field	List of all object properties and values of the selected objects
Property	Selecting the object properties that must be filtered
Filter-/Searchtext	Entering a search string. Only matching objects in the list are displayed.
Activate filter	Enable or disable the filter for the list view.
Search	Entering a text (string or substring) which will be replaced by another. "*" can be used as a wildcard in the search.
Replace	Entering a text (string or substring) with which the searched for text will be replaced.
[Replace]	Text in the "Search" field is replaced by a text in the "Replace" field. After activating the filter the function only refers to filtered results, no to the entire database.
[Undo]	Reverse the last replace action. Can be applied also to inserting or removing of objects in the list field.
Show property parameters	Displaying the accessibility (acc - Access), value change (mod - Modified) and optional fields (opt - optional) of the object properties.
Activate sort	Display sorted list via "sort settings"
Activate profile	Display furnished profile via "Edit profile"

Table 31: Context Menu Selection Options

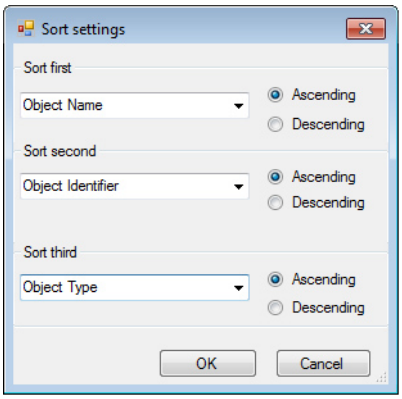
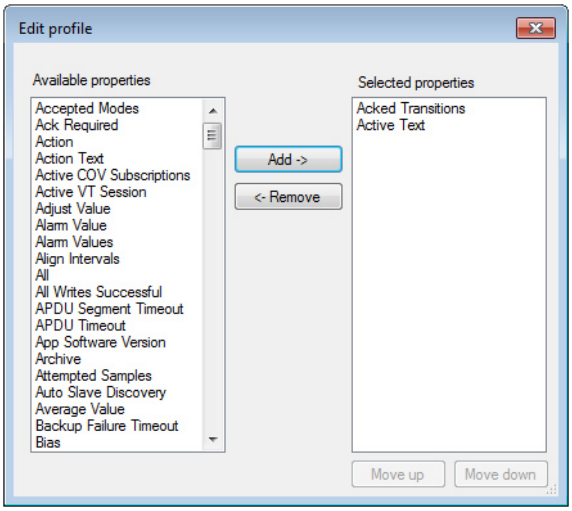
Menu item	Description	
[Sort settings]	The dialog “Sort settings” is used to sort the object properties list.  Figure 65: Sort Settings	
	Sort first/second/third	Selecting three object properties according to which must be sorted.
	Ascending	Selecting to sort the list in ascending order according to the selected property.
	Descending	Selecting to sort the list in descending order according to the selected property.
[Edit profile]	The dialog “Edit profile” is used to create a profile view for the object properties list.  Figure 66: Edit Profile	
	Available properties	List of all available object properties
	Selected properties	Object properties that must be listed in the profile view.
	[Add→]	Select the object property for profile view.
	[← Remove]	Remove the object property from the profile view.
	[Move up]	Shift marked object property one position forward.
	[Move down]	Shift marked object property one position downward.
	[OK]	Include selected object properties in the profile view.
	[Cancel]	Close window. Changes are not stored.
[Import]	Import object list in *.csv format.	

Table 31: Context Menu Selection Options

Menu item	Description
[Export]	Import object list in *.csv format. (Selection is possible grouped according to objects or files)
[Close]	Closing the window

You can copy (Copy), insert (Paste), delete (Delete) add additional objects (Add Object) or remove objects (Remove object).

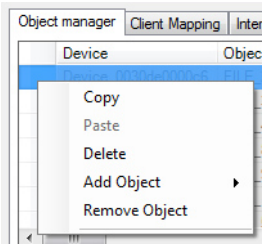


Figure 67: Context Menu “Object Manager”

4.2.5.2 Client Mapping

Client Mappings are mappings/links of one property or variable to a property in another (or, if desired, to the same) device.

Both IEC variables and BACnet properties of objects of a device can be linked in the BACnet Configurator with the BACnet properties of objects of other devices. These links can be configured.

- “Read Maps” on a device A (client) read values of BACnet properties in another device B (server) and writes these values in IEC variables or BACnet properties in device A; reading of the value can therefore take place at regular, definable time intervals or only with a change in value. Reading the value with each change in value (COV - Change Of Value) functions via a subscription mechanism (COV Subscription) and must be supported by device B. In this case, subscriptions are renewed at time intervals that can be set.

- “Write Maps” on a device A sends values of BACnet properties or IEC variables to BACnet properties in another device B.

For REAL values, an optional, minimum increment can be established by which the absolute value of the value must change before a value change is forwarded.

Changes in “Client Mappings” can be accomplished via two dialogs:

1. **Via the “Client Mapping Editor”**
   It will be opened in registry “Configure” via a right mouse click on an object property or via the “Client Mappings” button in the tool bar.
   The Client Mapping Editor is not modal and indicates editable configurations of associated Client Mappings for just enabled properties.
   You can find an example for the creation of Client Mappings in section “Creating a Client Mapping”.

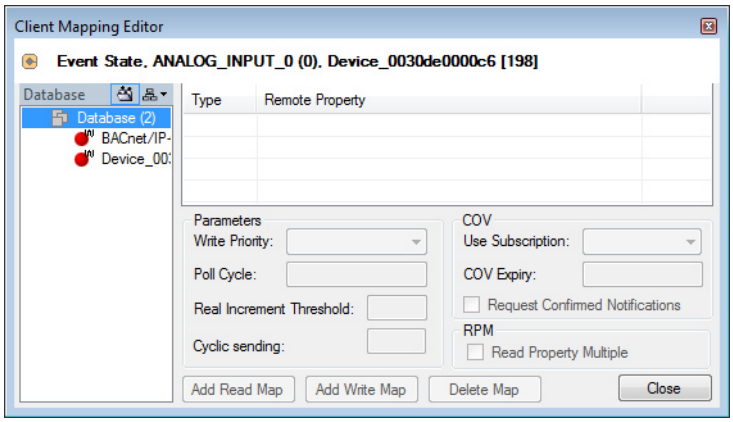


Figure 68: “Client Mappings” in the “Client Mapping Editor”

2. **Via the “Client Mappings” tab integrated in the “Device Manager”.**

Both dialogs are functionally identical, however, default settings can also be saved within the “Device Manager”. The displayed list can also be sorted/filtered.

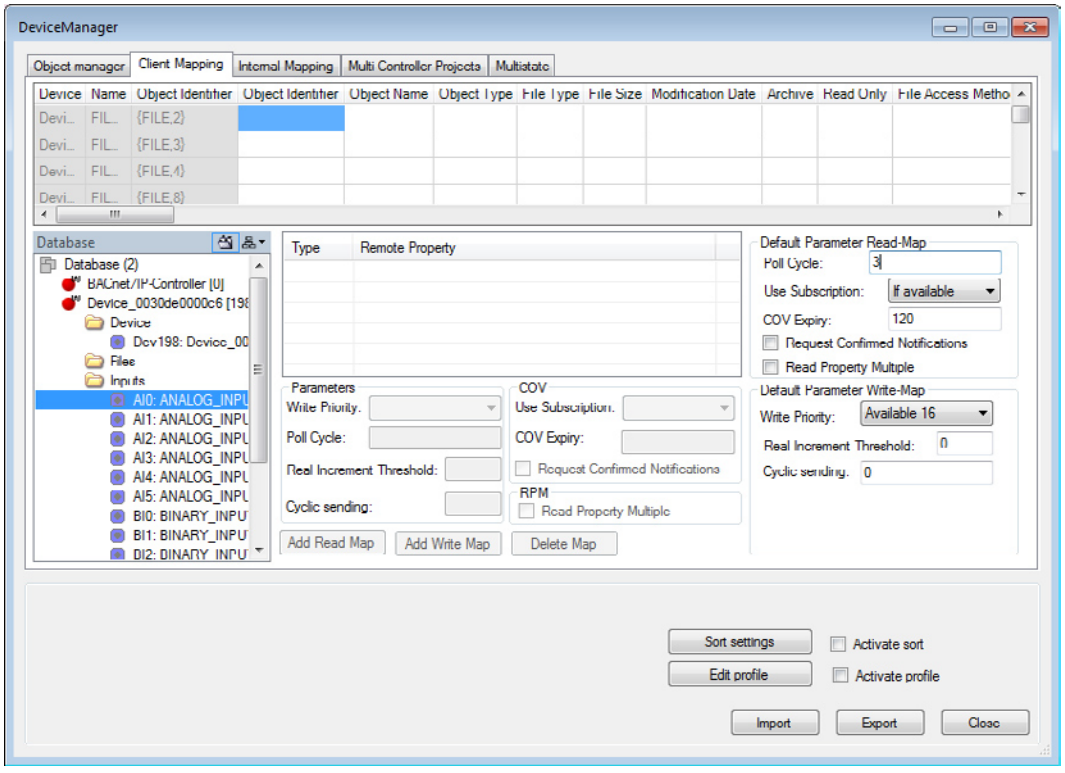


Figure 9: “Client Mapping” in the “Device Manager”

Table 32: Client Mapping Editor

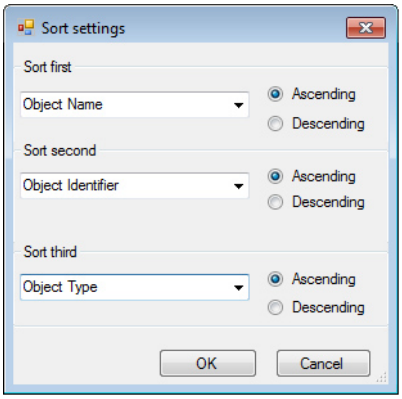
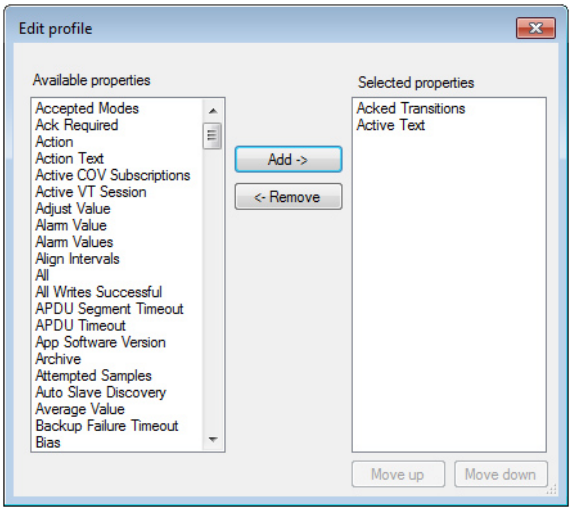
Menu Item	Description
List of available links	
-Type	Type of link, reading or writing
-Remote Property	Remote property linked with the local property via Client Mapping
Parameters	
-Write Priority	Setting the write priority
-Poll Cycle	Setting of the time interval for requests if no COV is supported (in seconds)
-Real Increment Threshold	For real-valued properties, the value by which the property value must change so that it is updated
-Cyclic sending	Interval in which the write operation of the client mapping is performed (only when “write map” is enabled). Value range 0 to 65535 seconds (0 = no cyclic transmitting)
COV	
-Use Subscriptions	Use of transmission during value change (Change of Value) – “If available”, “Never” or “Always”
-COV Expiry	Time in seconds after which a subscription to changes of value in a remote property expires Such subscriptions are set up and managed by the BACnet services SubscribeCOV or SubscribeCOVProperty.
-Request Confirmed Notifications	COV notifications can be either “confirmed” (recipient confirms receipt to the sender) or “unconfirmed” (with-out notification to the sender). If the sender receives no confirmation for “confirmed” notifications, it usually resends the report one or more times until it receives a confirmation of receipt.
RPM	
-Read Property Multiple	All “Read Client Mappings”, for which this option is selected, are combined into a “ReadPropertyMultiple”.
[Add Read Map]	The controller that has just been configured executes read access of the remote property.
[Add Write Map]	The controller that has just been configured executes write access of the remote property.
[Delete Map]	Deletion of selected link
Default Parameter Read/Write-Map	Perform default settings, which are already preset when opening the “Device Manager” again. (These settings do not apply for the non-modular “Client mapping editor”).
Activate sort	Display sorted list via “sort settings”
Activate profile	Display furnished profile via “Edit profile”
[Sort settings]	The dialog “Sort settings” is used to sort the object properties list.  Figure 69: Sort Settings

Table 32: Client Mapping Editor

Menu Item	Description	
	Sort first/second/third	Selecting three object properties according to which must be sorted.
	Ascending	Selecting to sort the list in ascending order according to the selected property.
	Descending	Selecting to sort the list in descending order according to the selected property.
[Edit profile]	The dialog “Edit profile” is used to create a profile view for the object properties list.  Figure 70: Edit Profile	
	Available properties	List of all available object properties
	Selected properties	Object properties that must be listed in the profile view.
	[Add →]	Select the object property for profile view.
	[← Remove]	Select the object property from profile view.
	[Move up]	Shift marked object property one position forward.
	[Move down]	Shift marked object property one position downward.
	[OK]	Include selected object properties in the profile view.
	[Cancel]	Close window. Changes are not stored.
[Import]	Import object list in *.csv format.	
[Export]	Import object list in *.csv format. (Selection is possible grouped according to objects or files)	
[Close]	Closing the window	

Via a right click on the objects, you can delete these (Delete).

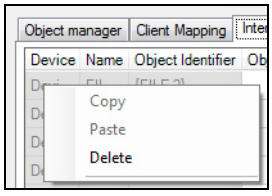


Figure 71: Context Menu “Internal Mapping”

4.2.5.3 Internal Mapping (IEC Mapping)

Internal Mapping is understood as the assignment of BACnet properties to IEC variables that are not BACnet properties. You can also carry out this assignment later with any IEC variables.

You import the SYM_XML file inside the “Configure:<device name>” tab. There is no provision for adding a variable here. However, you can assign variables that are not assigned to any property in the SYM_XML file.

You can find an example of the creation of Internal Mappings in section “Creation of Internal Mappings”.

Changes in “Internal Mappings” can be accomplished via two dialogs:

1. **Via the “IEC Mapping Editor”**
   This is opened in registry “Configure” via a right click on an object property and the menu item “Internal Mappings” or via the “IEC Mappings” button in the tool bar.

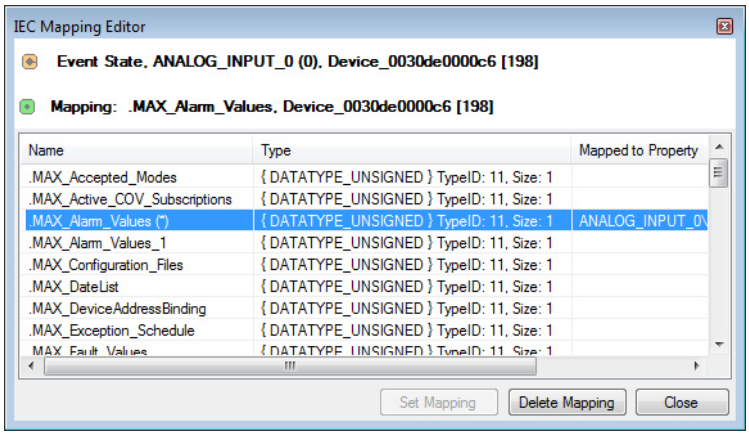


Figure 72: Internal Mapping in the IEC Mapping Editor

Table 33: IEC Mapping Editor

Menu Item	Description
Name	Name of the IEC variable (from the SYM_XML file)
Type	Data type of the IEC variable (from the SYM_XML file)
Mapped to Property	Name of the BACnet property with which the IEC variable is linked
[Set Mapping]	Creation of a link
[Delete Mapping]	Deletion of a link
[Close]	Closing of the dialog

2. **Via the “IEC Mapping” tab integrated in the “Device Manager”.**

The links between the BACnet properties and the IEC variables are shown in the dialog. The list of properties can be sorted and filtered analog to the tab “Client Mappings” (see previous chapter).

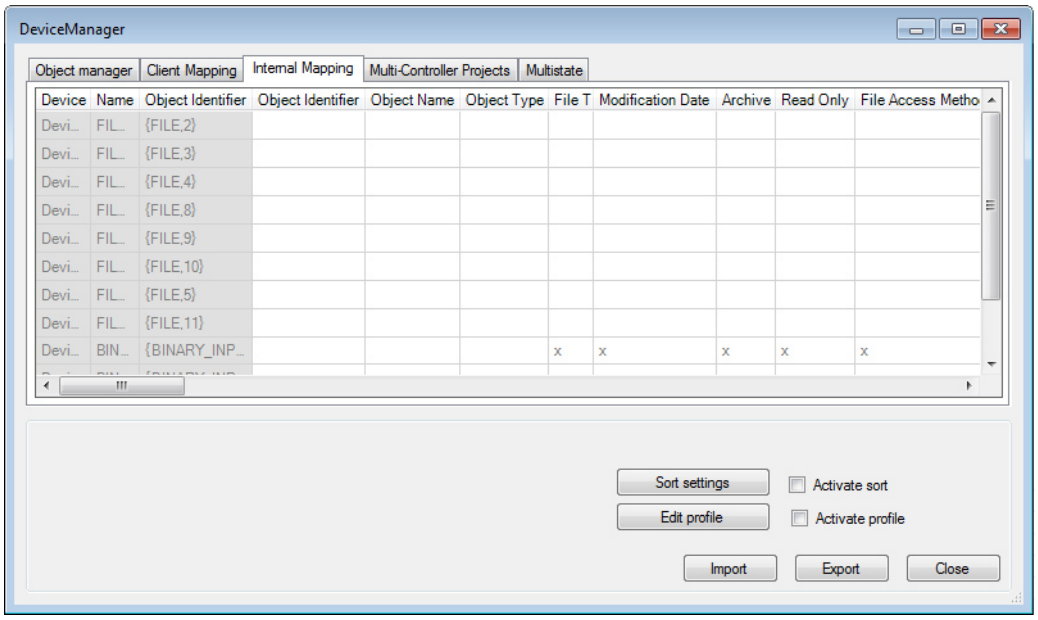


Figure 73: “Internal Mapping” in the “Device Manager”

Via a right click on the objects, you can copy (Copy), insert (Paste) or delete (Delete) these.

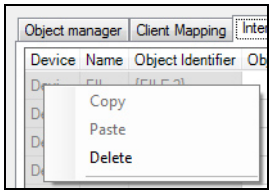


Figure 74: Context Menu “Internal Mapping”

4.2.5.4 Multi-Controller Projects

The fieldbus controllers contained in the project are displayed in this tab.

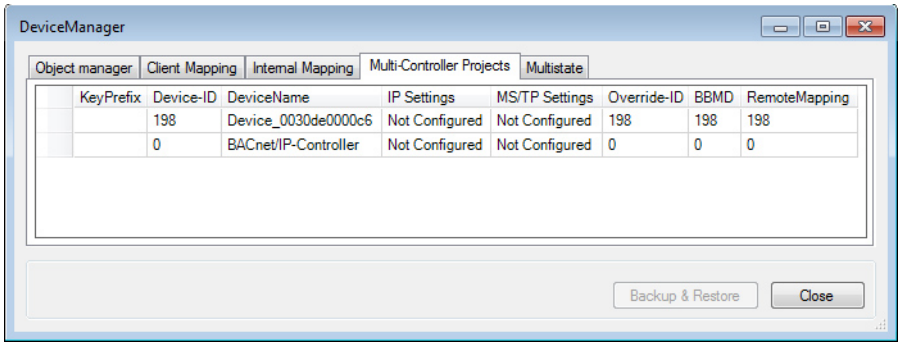


Figure 75: “Multi Controller Projects”

Table 34: Dialog window “Multi Controller Projects”

Menu item	Description
KeyPrefix	Content of the column “key name” in the EDE import file for device objects
Device-ID	Instance number of the device
DeviceName	Name of the device
IP Settings	IP settings of the device
Override-ID	Instance number of a reference device, the objects of which must be included for this device.
BBMD	Instance number of a reference device, the “Broadcast Distribution Table” BDT of which must be included for this device.
RemoteMapping	Instance number of a reference device, the “Client Mappings” of which must be included for this device.

Via a right click on the devices, you can copy (Copy), insert (Paste), delete (Delete) or backup/restore these (Backup & Restore).

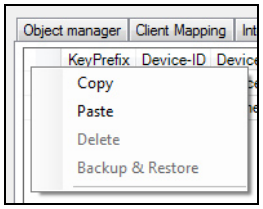


Figure 76: Context Menu “Multi Controller Projects”

Duplicating fieldbus controllers is logical, if the same WAGO-I/O-*PRO* application must be used for two or more fieldbus controllers and only the BACnet configurations vary (i.e. IP addresses or object names).

When copying the fieldbus controller, a copy of the device is created with a new device ID including all objects.

The columns Override ID, BBMD and Remote Mapping thereby initially include a reference to the original device (changeable, see previous table).

The function “Backup & Restore” can be used for all devices that are online.

4.2.5.5 Multistate

The content of this tab corresponds to the “Object manager” tab (see chapter “**Fehler! Verweisquelle konnte nicht gefunden werden.**”), but only the multistate objects are displayed.

In addition to the familiar buttons, the **[Manage State Text]** button is also available to configure state texts. If a state text is created for a multistate object (“Add Property” → “State Text”), a template can be created and assigned for this object via the “Device manager” tab > "Multistate" tab.

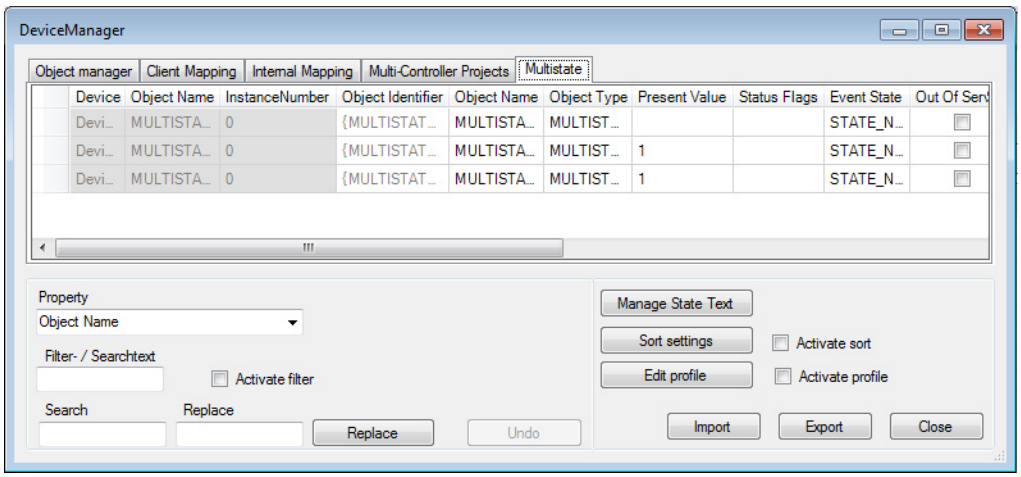


Figure 77: “Device manager”, “Multistate” Tab

1. To open the dialog for creaing state text templates, click the **[Manage State Text]** button.

2. To create a template, right-click the “Template Name” column and select **Add** in the context menu.
   Note! To create an object in the Multi-State-Manager, there must be at least one object already. If not, the first object must be created via the device manager.

3. Give the template a name.

4. Select the template created and right-click in the “Multistate text” table on the right.

5. Select **Add** and enter one or more state texts for the template.

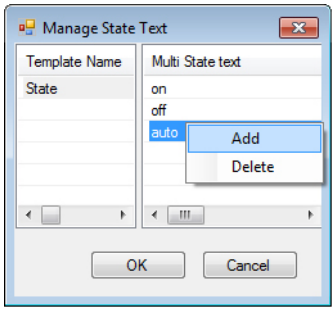


Figure 78: Defining State Texts

6. In the “Multistate” tab of the device manager, click an entry in the “State Text” column (requirement: The “State Text” property has been added to the multistate object in advance).

   A “Set new state text” window opens.

7. In the selection box, you can select the defined template and assign it to the multistate object via **[Set new state texts]**.

   The state texts are assigned to the multistate object and can be viewed in the object configuration.

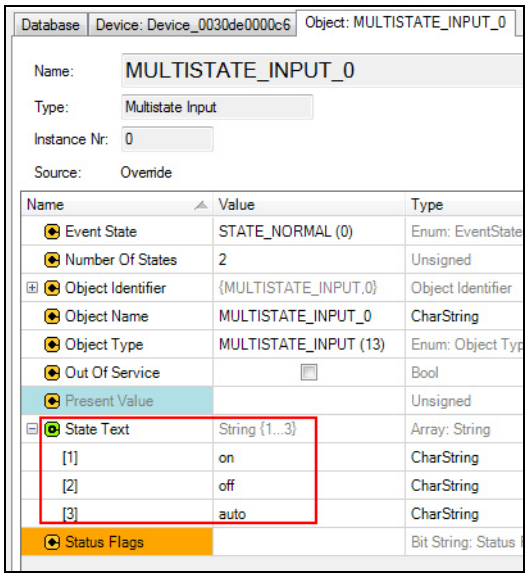


Figure 79: State Text in the Object Configuration

4.3 Online and Offline Status

The BACnet Configurator has two main modes for the configuration of a WAGO BACnet/IP Controller:

- Online configuration mode (with the controller connected to a BACnet/IP network)
- Offline configuration mode

In both modes, the following actions can be carried out:

- Importing the SYM_XML
  Note: If an SYM_XML file is imported in the online mode for a controller, then this has precedence over every other SYM_XML file of the controller
- Importing/exporting the Override file
  Note: If an Override file is imported in the online mode for a controller, then this has precedence over every other Override of the controller
- Importing/exporting of BACnet EDE files
- Processing of native, SYM_XML- and Override-defined BACnet objects:
  - Addition and removal of Override-defined objects.
  - Addition, changing and removal of optional properties
  - Enabling/disabling of “Intrinsic Reporting”
  - Enabling and disabling of the reporting of changes in value (SubscribeCOV and SubscribeCOVProperty service)
- Editing of Client Mapping (between BACnet properties)
- Editing of Internal Mapping (between IEC variables and BACnet properties) insofar as IEC variables are not already permanently linked with a property via SYM_XML.

In the online configuration mode, you can also carry out the following actions:

- Downloading of the configuration files SYM_XML and Override
- Uploading of the configuration files into a BACnet device using backup and restoration procedures
- Carry out a search for BACnet devices and their objects which are present in the network
- Reading and writing of property values for each BACnet device in the BACnet/IP network.
- Backup and restoration for all BACnet devices that support these procedures
- Restarting of BACnet devices in the BACnet/IP network

- Enabling/disabling of BACnet communication between BACnet devices in the BACnet/IP network
- Synchronization of the time of BACnet devices in the BACnet/IP network
- Addition and deletion of list entries in Recipient_List properties of the Notification-Class objects in BACnet devices located in the BACnet/IP network

4.4 Software Deinstallation

1. Click on the entry **Software** under **Start** > **Settings** > **System Control.**
2. Choose the entry “WAGO BACnet Configurator” and click on the button **[Remove].**

5 Example Configuration

In the following, some configuration possibilities are described, for example the search for devices in the network, the editing of found devices and objects, the loading of the configuration to a BACnet/IP controller or the creation of a Client Mapping and Internal Mapping.

5.1 Configuring New Devices

Link the WAGO BACnet/IP controller to your network.

Configure the device with the BACnet Configurator:

1. Open the BACnet Configurator.

As long as the button **Device Auto Discovery** is enabled (highlighted in color), new devices are searched for at regular intervals and the list in the Scan pool is updated.

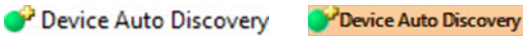


Figure 80: Automatic Device Search Disabled (Left) or Enabled (Right)

You can change the interval for the search through **Extras** > **Options**.

The progress bar at the lower right shows you the status of the search.
As an alternative, you can conduct the network scan using the button **[Scan BACnet]** (magnifier).

A newly found device is presented with its standard values and standard in-stance number in the “Scan” pool.

2. Click on the “+” in front of the device in the “Scan” pool

Below the device, different folders are displayed (see following Figure). The folder “Device” contains the Device Object of the device. The folders “Inputs” and “Outputs” are created for the modules connected to the device, which are rep-resented by native objects. Even more folders are possible, such as “Files” for SYM_XML and Override files.

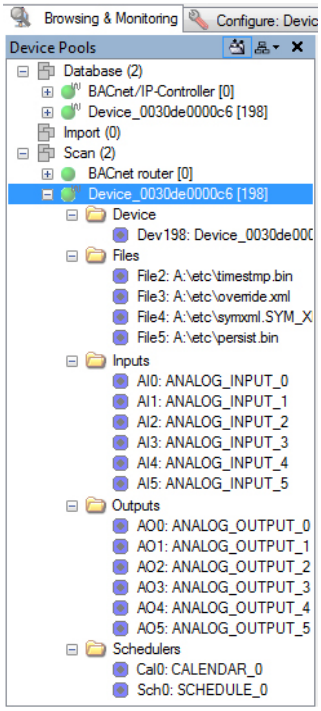


Figure 81: Device with Its Objects

3. Choose **Configure** in the context menu of the device to configure the device. As an alternative, choose **Device > Configure** in the main menu or use the button **[Configure]** to the right in the window.

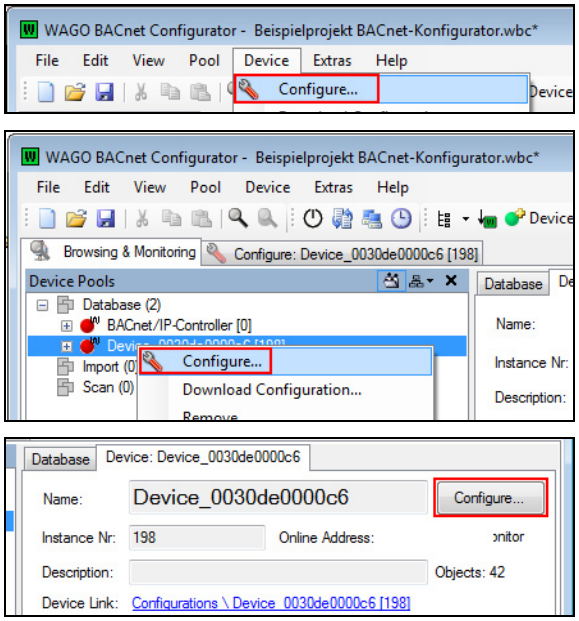


Figure 82: Three Possibilities for Configuring a Device

The configuration area with the “Configure:<Unnamed>” tabs is opened. Any available configuration data from the device is uploaded and displayed.

Add two objects to the device:

4. Click with the right mouse button on the Device Object and select **Add Object** > **Schedule** and **Add Object** > **Calendar** in the context menu.

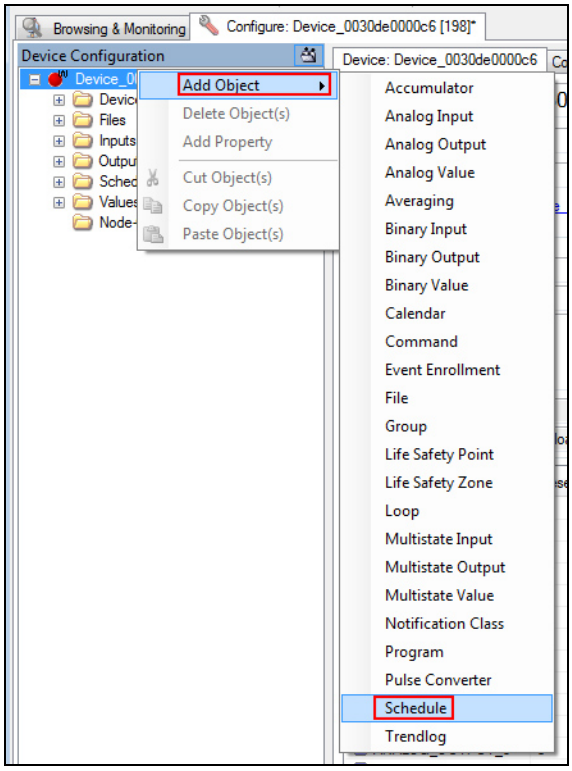


Figure 83: Add Objects Using the Context Menu

You need the Calendar Object to be able to indicate exception dates for certain actions in later steps.

5. Also choose the Alarm-Server Object using **Add Object** > **Notification Class** to generate alarms with some of the native objects below.

The three objects are added to the list and can continue to be configured.

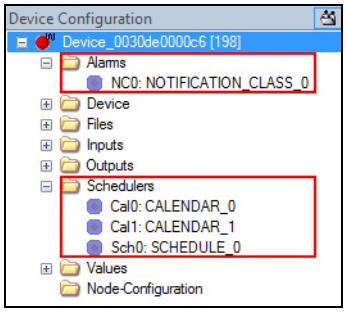


Figure 84: Newly Created Objects

6. Select the Schedule object in the tree to the left or in the object list to the right; this will open the detail view of the object in the configuration area.

The Schedule object contains, by default, a weekly programmable schedule “Weekly Schedule”, but no exception rules for the “Exception Schedule” yet, which is used for holidays, for example.

7. Click with the right mouse button on the list of object properties and choose **Add Property > Exception Schedule** in the context menu.

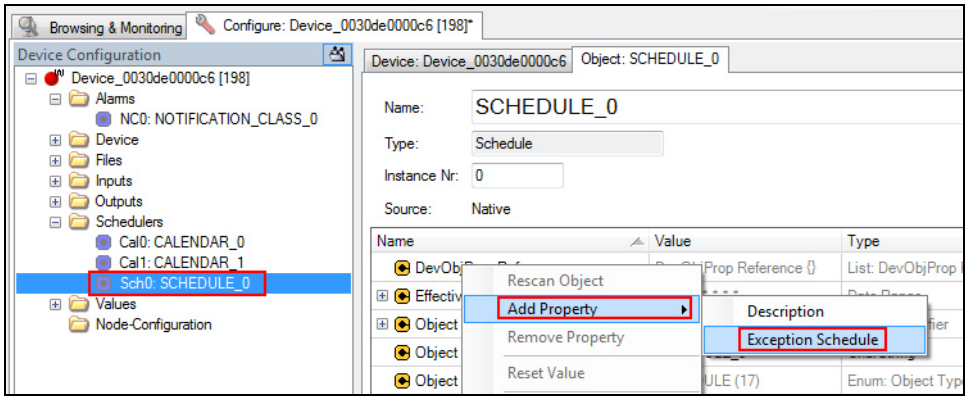


Figure 85: Adding Properties

8. Also add a description using **Add Property > Description**.

The newly added properties can be further configured.

9. Click with the right mouse button on **Exception Schedule** and choose **Add Element.**

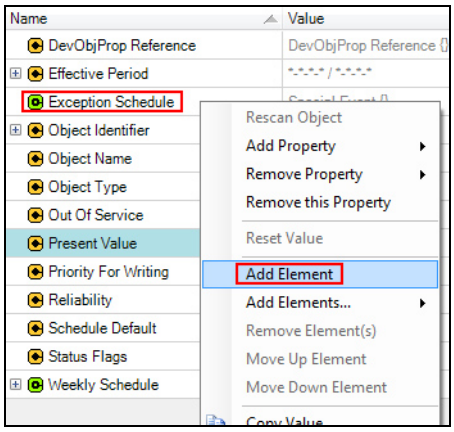


Figure 86: Adding Elements

A new element “[1]” is displayed below the “Exception Schedule”.

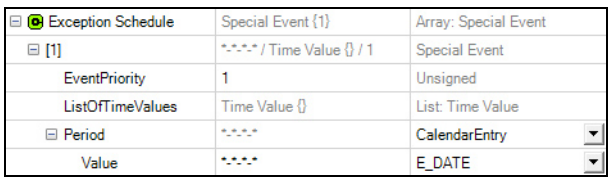


Figure 87: New Element

10. Holidays will serve as the exception rule in relation to the calendar in this example. To this end, choose the type “Calendar Reference” under **Period**.

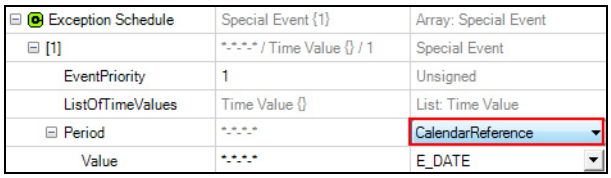


Figure 88: Defining the Calendar

11. Confirm your entry with Enter.

Below “Period”, additional points are displayed: “InstanceNumber” and “Type”.

12. Under **Type** choose the desired calendar, e.g. “CALENDAR (6)” and “0” as the **InstanceNumber**.

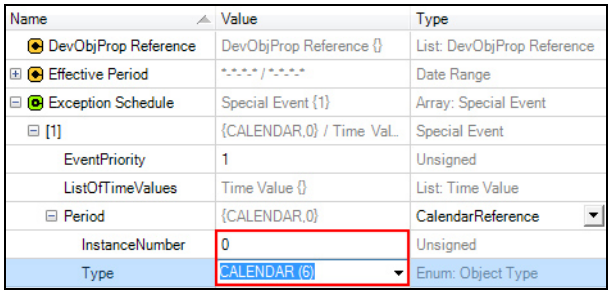


Figure 89: Changing Entries in Elements

In the “ListOfTimeValues”, enter the exception times:

13. Right click on **ListOfTimeValues** and choose **AddElement** in the context menu.

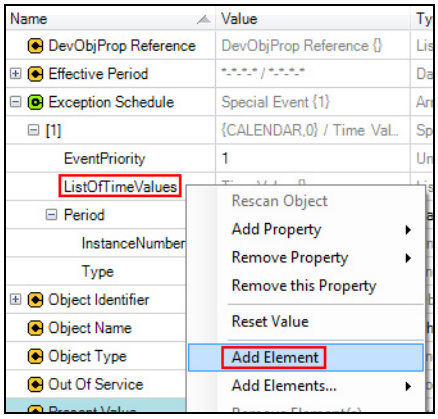


Figure 90: Changing Entries in Elements

A new element “[1]” is displayed below the “ListOfTimeValues”.

Assign certain values to certain times for the exception times in the calendar:

14. Next, enter “Real” under **Type** and then the value “10” under **Value**.

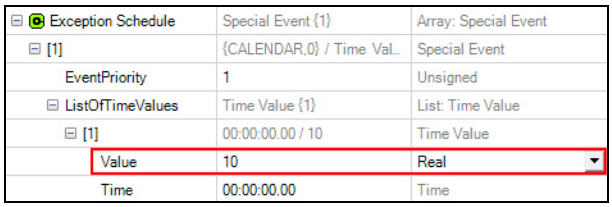


Figure 91: Entering Values in the Calendar

15. **“Time”** is used to set the time at which the exception is to apply, for example “00:10:00:00” in order to define a switching point at 0:10.

Note

Define the switching point for midnight when switching times span more than one day!
If you want to define day-to-day switching times, then 00:00:00:00 must be defined as extra switching point.
Example: Switching on the light at 20:15 in the evening, switching off the light at 7:30 in the morning on the next day:

On	[1] Monday	20:15:00:00
On	[2] Tuesday	00:00:00:00
Off	[2] Tuesday	07:30:00:00

16. Using **EventPriority** enter the priority of the exception rule, e.g. “1” for a low priority.

In the “Weekly Schedule”, enter certain values as the event for starting an action for each weekday. Seven schedules, from Monday [1] through Sunday [7], can be created per week. Here, you enter the values in the same way as for the exception rule “Exception Schedule” (see point 14 and 15).

To enter holidays, add elements in the date list in the Calendar object:

17. Choose the **Calendar** Object in the tree to the left.

18. Click with the right mouse button on the property Data List and add an entry “[1]” using **Add Element**.

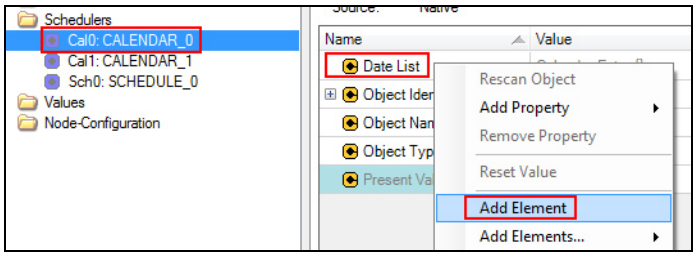


Figure 92: Adding Holidays

Tip:
To create several entries at the same time, click on **Add Element<u>s</u>** and select the desired number of new elements in the display.

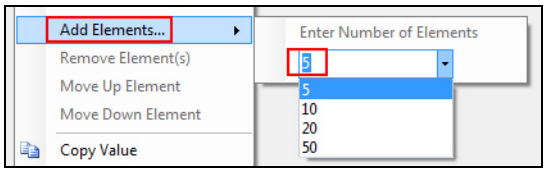


Figure 93: Adding Several New Elements

19. Click on the entry “[1]” and enter the date “2014-07-10-3” as the value and “E_DATE” as the **Type** (see following Figure).
Format of the date:
YYYY-MM-DD-W
wherein the last number represents the day of the week (1 – Monday through 7 – Sunday)
For each field, “*” may be used as a wildcard, e.g. 2008-12-*-* for all days in December 2008. As an alternative, an editor can also be used, which you can open by clicking in the data field and on the button [...].

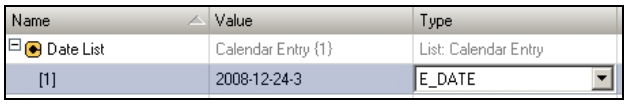


Figure 94: Entering an exception date

You have now defined exception rules, schedules and holidays in order to trigger particular switching time actions.

To generate alarms as shown below, use the already added notification class object as well as the alarm generators, which generate the alarms. Analog-Input Objects are used as alarm generators, for instance:

The alarms are sent to those recipients whom you define using the Notification Class Object:

20. Select the **Notification Class** Object in the tree to the left.

21. Click with the right mouse button on **Recipient List** and select **Add Element(s)** to add new recipients to the recipient list for the object's alarms.

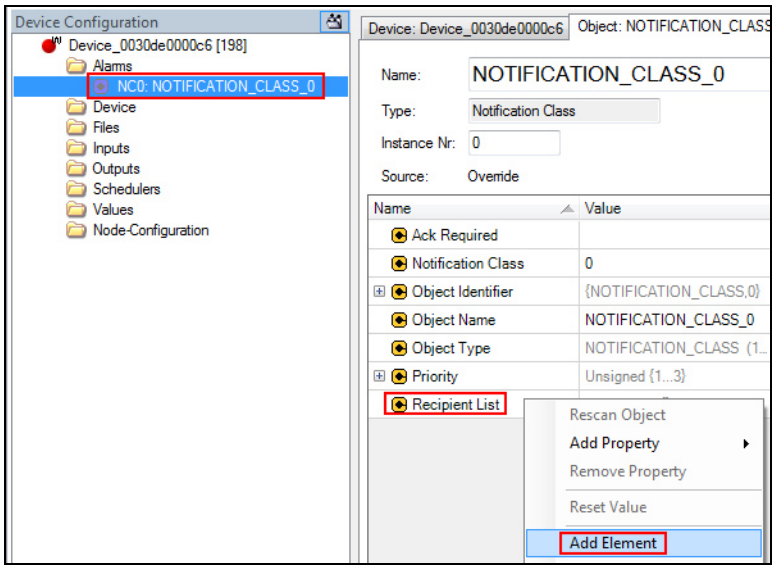


Figure 95: Entering New Recipients for Alarms

A sub-element “[1]” is inserted. It represents a new recipient, which is further configured.

Recipient List	Destination {1}	List: Destination
[1]	{ANALOG_INPUT,0} -> 0	Destination
Transitions		Bit String: Event Transitions
IssueConfirmedNotif...	☐	Bool
ProcessIdentifier	0	Unsigned
Recipient	{ANALOG_INPUT,0}	ObjectIdentifier
InstanceNumber	0	Unsigned
Type	ANALOG_INPUT (0)	Enum: Object Type
ToTime	00:00:00.00	Time
FromTime	00:00:00.00	Time
ValidDays		Bit String: Days Of Week

Figure 96: Configuring New Recipients

Note: Usually, recipients enter themselves through the network.

Now, configure the alarm generator (e.g., analog input object):

22. Click on **Analog Input** to the left in the tree.

23. Select **Add Property > Notification Class** in the context menu of an object property to add the property “Notification Class” to the object.

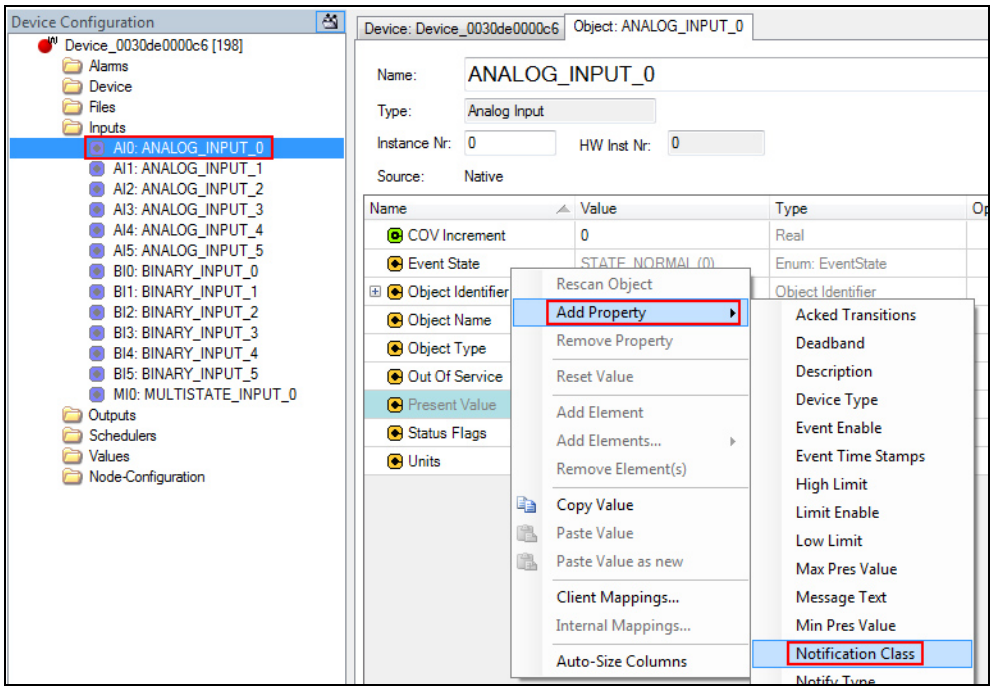


Figure 97: Adding the property “Notification Class” to the Analog Input Object

The property "Notification Class" automatically expands the object to include all properties that are necessary for alarm generation. These properties are indicated with a green symbol since these are optional properties.

Name	Value	Type	Opt	Acc
Acked Transitions	TO_OFF_NORMAL, TO_F...	Bit String: Event Transitions		
COV Increment	0	Real		
Deadband	0	Real		
Event Enable	TO_OFF_NORMAL, TO_F...	Bit String: Event Transitions		
Event State	STATE_NORMAL (0)	Enum: EventState		
Event Time Stamps	Time Stamp {1...3}	Array: Time Stamp		
High Limit	0	Real		
Limit Enable	LOW_LIMIT_ENABLE, HI...	Bit String: Limit Enable		
Low Limit	0	Real		
Notification Class	0	Unsigned		
Notify Type	ALARM (0)	Enum: Notify Type		
Object Identifier	{ANALOG_INPUT,0}	Object Identifier		
Object Name	ANALOG_INPUT_0	CharString		
Object Type	ANALOG_INPUT (0)	Enum: Object Type		
Out Of Service		Bool		
Present Value		Real		
Status Flags		Bit String: Status Flags		
Time Delay	0	Unsigned		
Units	NO_UNITS (95)	Enum: Engineering Units		

Figure 98: New Properties when Adding the Property “Notification Class”

The alarm generation is configured via the added properties.

These settings are also possible online if an Alarm Client writes the properties. In this example, however, you are determining static values for the time being:

24. Enable the entry “HIGH_LIMIT_ENABLE” under **Limit Enable** and disable the entry “LOW_LIMIT_ALARM”. With this action, only upper limits are allowed.

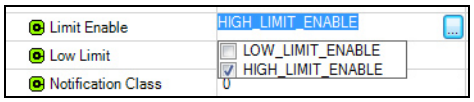


Figure 99: Enabling and Disabling theProperties

25. Enter the value “100” under **High Limit** as the upper limit.

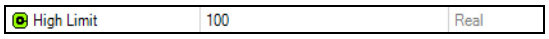


Figure 100: Entering Values

All input and output objects can function as alarm generators if the property “Notification Class” is added. Alarms that are triggered in the Input and Out-put Object are sent to the recipient list in the Notification Class Object.

26. Click on the button **[Store and Download]** to apply the configuration and store it in the memory.

A dialog in which the device is displayed is opened, and you configuration is loaded to this device. The device address is made up of the network number; the IP address and the BACnet MAC address together, each separated by a colon.

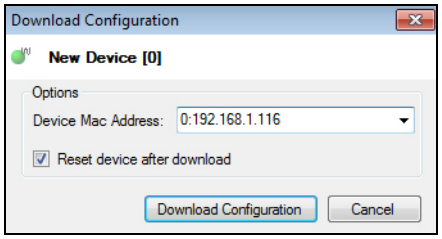


Figure 101: Uploading the Configuration

27. Enable **Reset device after download** and enter a password (if necessary) to restart the device after downloading the configuration.

28. Click on **[Download Configuration]**.

Check whether the configuration was successful:

29. Change over to the “Browsing & Monitoring” tab.

30. Click on **Rescan selected Device(s)** in the context menu of the configured device (Scan pool) to read in only this device again.

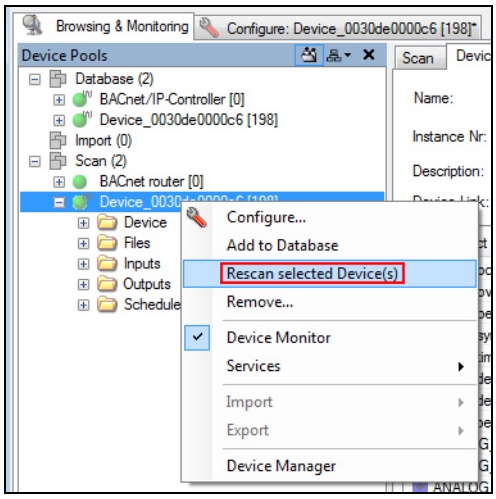


Figure 102: Updating the device via “Rescan device”

The view is updated. Under the configured device, you will see additional folders, such as “Schedules” and “Alarms”, in which the objects “Calendar”, “Schedule” and “Notification Class” that you have previously configured are contained.

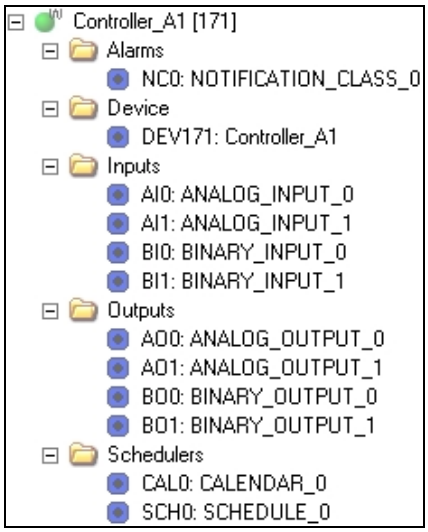


Figure 103: New Folders for “Schedules” and “Alarms”

In the Analog Input Object, which you have configured to an alarm generator, you will see all the properties necessary for alarm generation in the configuration mode.

If “Monitoring” is enabled, you will have a current view of the data in the “Browsing & Monitoring” tab. Live values that you can change during the runtime are displayed. In the "Configure" tab, on the other hand, the values are static and are not updated.

Now change one of the live values and transmit this directly to the controller:

31. Click on the configured device to the left in the tree.

32. Click on **Analog Input_0** in the folder **Inputs**.

33. Enter a new value “500” for the property **High Limit**, which you configured under point 25.

34. Using **[Commit Values]**, transmit the value directly to the controller.

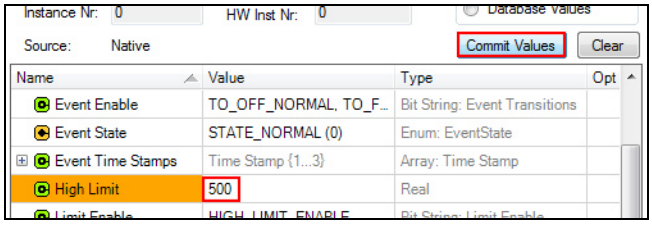


Figure 104: Transmitting Values Directly via “Commit Value”

If the write process is successful, the property is marked in green and the “Write Status” is set to “OK”.

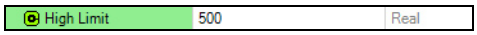


Figure 105: Successful Value Transmission

If the write operation fails, an error message is displayed under “Write Status”. The property is marked with red.

It is possible to change several values and transmit them together.

35. Set **Time Delay** to “10” and **Deadband** to “10”.

Both “Time Delay” and “Deadband” are then highlighted in orange.

36. Transmit both value changes together via **[Commit Value]**.

After the transmission, both are marked in green and have the status “OK”. In this way, for example, data from other manufacturers that cannot be stored in the database can also be easily changed.

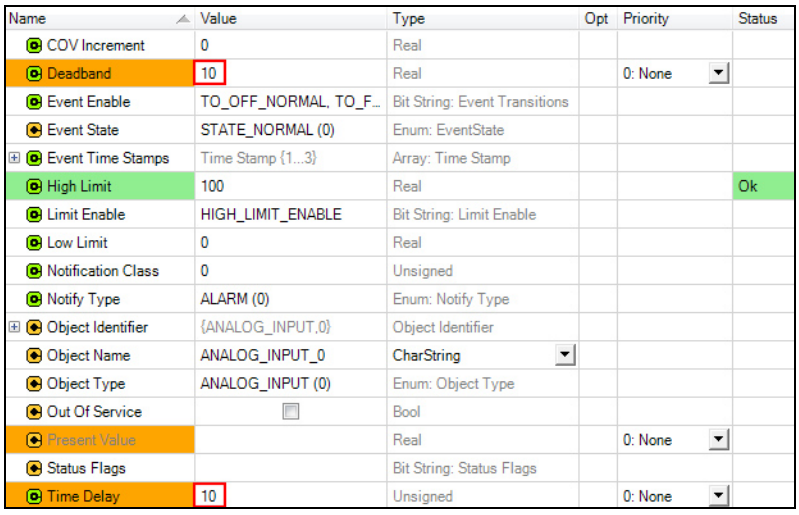


Figure 106: Transmission of Several Values

Name	Value	Type	Opt	Priority	Status
COV Increment	0	Real			
Deadband	0	Real			Ok
Event Enable	TO_OFF_NORMAL, TO_F...	Bit String: Event Transitions			
Event State	STATE_NORMAL (0)	Enum: EventState			
⊞ Event Time Stamps	Time Stamp {1...3}	Array: Time Stamp			
High Limit	100	Real			Ok
Limit Enable	HIGH_LIMIT_ENABLE	Bit String: Limit Enable			
Low Limit	0	Real			
Notification Class	0	Unsigned			
Notify Type	ALARM (0)	Enum: Notify Type			
⊞ Object Identifier	{ANALOG_INPUT,0}	Object Identifier			
Object Name	ANALOG_INPUT_0	CharString			
Object Type	ANALOG_INPUT (0)	Enum: Object Type			
Out Of Service	☐	Bool			
Present Value		Real			
Status Flags		Bit String: Status Flags			
Time Delay	0	Unsigned			Ok

Figure 107: Several values successfully transferred, status OK

5.2 Use EDE File Import

You can pre-configure objects and basic object properties in the EDE file. EDE import is used in the BACnet Configurator to create these objects.

If you also list a specific module type in the EDE file, the same number of digital/analog inputs/outputs are automatically created in the BACnet Configurator as the module actually has.

You can also use IEC data structures from WAGO-I/O-*PRO*. If an SYM_XML file from an IEC application that contains objects belonging to the EDE file is then imported, the IEC data structure is mapped to the BACnet data structure after downloading the configuration to a fieldbus controller.

5.2.1 EDE File Structure

The EDE file contains columns for its own basic object properties. These properties can be pre-configured in the tables directly.

The object information is unsorted in the EDE file.

5.2.1.1 Header

- **PROJECT_NAME**
  Name and place of the project
- **VERSION_OF_REFERENCEFILE**
  Version of the referenced data point list
- **TIMESTAMP_OF_LAST_CHANGE**
  Date and time of the last change
- **AUTHOR_OF_LAST_CHANGE**
  Name of the author of the last change
- **VERSION_OF_LAYOUT**
  Version of the layout used for the EDE file (the layout should remain the same within a project)

5.2.1.2 Required Properties

A valid EDE file must contain at least one device object.

Note

Object instance and/or VendorSpecificAddress required!
Either the object instance and/or the VendorSpecificAddress must be listed per line in the EDE file. If a line in the “object-instance” column contains no entry, but there is an en-try in the “vendor-specific-address” column, the object instance is the same as the hardware instance. If there is an object instance, it is used as the object instance.

Note

#keyname required if only device object is created!
If only one device object is created, a **#keyname** for the import is required because the device is not created otherwise. If data is missing in the other columns, the default value of the BACnet Configurator is added except in the case of the note above.

The following fields must be populated (mandatory):

- **#keyname**
  The name is freely selectable. The name is not evaluated during import.
  Recommendation, if data is exchanged with other devices:
  [DeviceInstanceNumber]_Device_[MAC-ID]_[Object]_[Channel]
  e.g.: 198_Device_0030de0000c6_ANALOG_INPUT_0

- **device obj.-instance**
  Device instance number or instance number of the device object
  (You calculate the instance number from the 22 bit (LSB) of the MAC-ID of the fieldbus controller.
  Example: MAC-ID 00:30:DE:00:00:c6 → 00:00:00C63F
  → $0x0000C6_{hex} = 198_{dez}$ → Geräteinstanznummer = 198).

- **object-name**
  Freely selectable name of the object, but must be unique within the device.

- **object-type**
  An object code is assigned to each object type, e.g., “8”for the device object. You can find an overview table of possible object codes in section “Example Configuration” > … >Creating and Importing an EDE File.

- **object-instance**
  For the device object, the object instance is the same as the device instance number “device obj.-instance” and is otherwise freely selectable.

- **vendor-specific-address**
  The entry for the “vendor-specific-address” varies depending on which object you want to create:

  - **Object with no connection to the IEC application or to specific module types:**
    No “vendor-specific-address” is required.

  - **Creating a WAGO-I/O-*PRO* object:**
    The name under “vendor-specific-address” must correspond to the name of the IEC data structure in WAGO-I/O-*PRO*, but with pre-fixed program name, e.g.: PLC_PRG.Name

  - **Creating an object taking the specific module type into account (e.g., 2-channel digital input module):**
    The “VendorSpecificAddress” column may specify on of the following three formats:

    XXX-XXX_YYY_ZZ
    XXXX-XXXX_YYY_ZZ
    XXX-XXX/XXX-XXX_YYY_ZZ
    XXXX-XXXX/XXXX-XXXX_YYY_ZZ

    X corresponds to a WAGO item number or order number, see the following example:

    750-402
    0750-0402
    750-402/000-000
    0750-0402/0025-0000

    There is not information about WAGO modules in the BACnet Configurator itself. The item number information in the EDE file, however, is used by BACnet Configurator as the cross reference to the “terminal.csv” file. In this file, the BACnet Configurator finds the corresponding data (number of digital/analog inputs/outputs) of the various modules and accepts these to map the objects of the connected module similar to the actual hardware (for a 4-channel digital input module, 4 binary input objects are also created).

    Y corresponds to the absolute position of the module on the controller. The first module behind the fieldbus controller has the number 001 (decimal).

    Z corresponds to the hardware channel of the module according to the data sheet.
    The first hardware channel has the number 01 (decimal).

Note

Observe the method of counting the hardware channels!
The method of counting the hardware channels does not necessarily correspond to the alphabetic order of the lettering on the module Example: For an 8-channel module with the following inscription, “F” does not correspond to channel 06 (counting vertically from left to right), rather channel 04 (horizontally from left to right).

A	E
B	F
C	G
D	H

Check the hardware channels each module type separately.

5.2.1.3 Optional Properties

(Empty fields are populated in the BACnet Configurator with default values.)

- **description**
  Description of the object
- **present-value-default**
  Default value of the object
- **min-present-value**
  Minimum value of the Present_Value
- **max-present-value**
  Maximum value of the Present_Value
- **commandable**
  This option indicates whether a writable property is set by an automatic process or whether it can be set by the client (Y or N).
- **supports COV**
  Indicates whether the object accepts COV subscriptions for the Present_Value (by default and recommendation "Y", otherwise "N")
- **hi-limit**
  Set the lower limit of the Present_Value
- **low-limit**
  Set the upper limit of the Present_Value
- **state-text-reference**
  This field is valid for binary objects and multi-state objects. The decimal values in this column reference entries in the "State-Text.csv" file.

- **unit-code**
  Code for the physical unit of measurement of the Present_Value property of the analog object (value of the "Units" property), e.g., “5” for the “Volt” unit. The table in Appendix “List of BACnet Engineering Units”.

5.2.2 Import Process

When importing an EDE file as a “WAGO Device”, the following actions are performed in the BACnet Configurator:

- A device is created in the Import folder
- The device contains at least one device object according to the EDE file (name, instance, description, etc. are applied)
- The device contains another object according tot he EDE file (name, instance, description, etc. are applied)
- The “terminal.csv” file is evaluated (for WAGO devices), so that the BACnet Configurator identifies all WAGO module types with the associated number of digital/analog inputs/outputs.
- If there is a reference to a specific module in the “vendor-specific-address” column in the EDE file, e.g., with the entry “750-402_001_01” behind a BI object, this information is linked to the in-formation of the "terminal.csv" file.
  The BACnet Configurator then creates three other generic BI object names in addition to the BI object already created because “terminal.csv” shows that module 750-402 has a total of 4 digital inputs (750-402,0**4**,00,00,00).

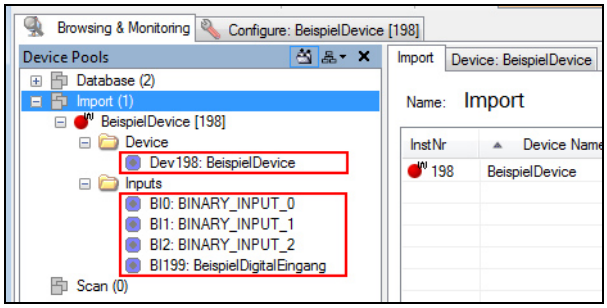


Figure 108: Imported Device with Device Object and Four BI Objects

For example, if the entry “750-402_001_01” is not in the EDE file, only the objects from the EDE file would be created when importing in the BACnet Configurator because the BACnet Configurator includes no reference to the actual number of inputs/outputs.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	# Proposal_Engineering-Data-Exchange - B.I.G.-EU															
2	PROJECT_NA	NeuBeispiel														
3	VERSION_OF_REFERENCEFILE															
4	TIMESTAMP_	11. Jul 14														
5	AUTHOR_OF_LAST_CHANGE															
6	VERSION_OF	2														
7	# mandatory	mandatory	mandatory	mandatory	mandatory	opt	op	op	opt	optic	opt	opt	optic	op	op	optional
8	# keyname	device obj. i	object name	object type	object instar	des	pr	mi	ma	comi	sup	hi	low	sta	ur	vendor specific address
9	198_Beispiel	198	BeispielDigitalEingang	3	199					N	Y					
10	198_Beispiel	198	BeispielDevice	8	198					N	Y					
11	198_Beispiel	198	BINARY_INPUT_2	3	2					N	Y					

Figure 109: EDE File with no Registered “Vendor-specific-address” as a Reference

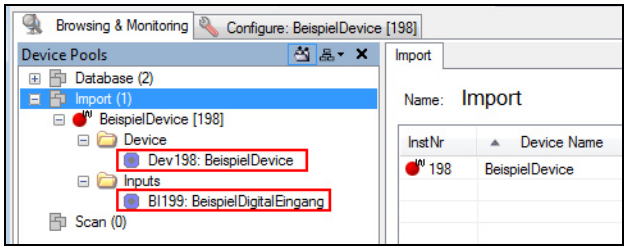


Figure 110: Imported Device with Device Object and only One BI Object

- If an IEC stat structure from WAGO-I/O-*PRO* is listed in the “vendor-specific-address” column in the EDE file, e.g., “PLC_PRG.AV1” of type Analog-Value, the information from the EDE file is linked in the BACnet Configurator to that of the associated SYM_XML file that is also imported, so that the BACnet objects are mapped to the BACnet structures of the IEC application.

5.2.2.1 Hardware Instance Number

The hardware instance number indicates the sequence of input/output channels for analog and digital input/output objects. The number results from the increment per BACnet object type in the order of the absolute module position considering the actual object number of module types.

The entered objects of the EDE file are created in the BACnet configurator upon import and contain a hardware instance number.

This means that the hardware instance number is assigned in ascending order (0, 1, 2, etc.). Counting restarts for each object type (analog/digital/input/output, etc.). For example, only as many objects can be as-signed to a 4-channel digital input module as it actually has, i.e., 4 digital input objects.

In the example, “ExampleDigitalInput” is the first object created by the EDE file. This is evident from the HW instance No. 0 (see Figure below) in the BACnet Configurator. The names of other objects are then formed generically with a sequential number (BI0 (HW instance No. 2) to BI2 (HW instance No. 3).

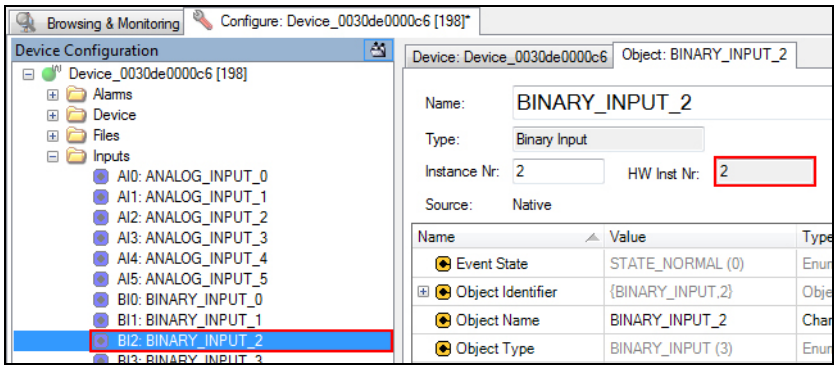


Figure 111: Hardware instance Number of the Object

Example of two 4-channel digital input modules on one controller:

750-402_001_01	HW instance: 0 (1st digital input)
750-402_001_02	HW instance: 1 (2nd digital input)
750-402_001_03	HW instance: 2 (3rd digital input)
750-402_001_04	HW instance: 3 (4th digital input)
750-402_002_01	HW instance: 4 (5th digital input)
750-402_002_02	HW instance: 5 (6th digital input)
750-402_002_03	HW instance: 6 (7th digital input)
750-402_002_04	HW instance: 7 (8th digital input)

Missing absolute module positions are permitted (in the following example, positions 001 to 015 and 017). This has no effect on the calculation. There are no digital input modules on positions 1 to 15, rather e.g., analog modules that are counted separately.

Example with missing module positions:

750-402_018_02	HW instance: 3 (4th digital input)
750-610_016_01 *	HW instance: 0 (1st digital input)
750-402_018_01	HW instance: 2 (3rd digital input)

(HW instance 1, 2nd digital input missing in the EDE file)

* The 750-610 module is a 2-channel digital input module

5.2.3 Creating and Importing an EDE File

1. Open an existing EDE file or create a new EDE file in CSV format.

Create at least one device object in the EDE table:

	A	B	C	D	E	F
1	# Proposal_Engineering-Data-Exchange - B.I.G.-EU					
2	PROJECT_NAME	EDEexample				
3	VERSION_OF_REFERENCEFILE	1				
4	TIMESTAMP_OF_LAST_CHANGE	11. Jul 14				
5	AUTHOR_OF_LAST_CHANGE	G. Sampler				
6	VERSION_OF_LAYOUT	02. Jan				
7	#mandatory	mandatory	mandatory	mandatory	mandatory	optional
8	# keyname	device obj.-instanc	object-name	object-type	object-instance	description
9	198_Device_0030de0000c6_ANALOG_INPUT_0	198	Beispiel Device	8	198	

Figure: 112: Creating a Device Object

2. Specify the name of the EDE object in the “#keyname” field.
   Recommendation:
   [DeviceInstanceNummer]_Device_[MAC-ID]_[Object]_[Channel]

3. Specify the instance number of the device object in the “device obj.-instance” field (You calculate the instance number from the 22 bit (LSB) of the MAC-ID of the fieldbus controller).
   Example: MAC-ID 00:30:DE:02:11:3F → 22 bit LSB ~~00:30:DE:~~02:11:3F → $0x2113F_{hex} = 135487_{dez}$ → device instance number = 135487).

4. Enter a freely selectable name in the “object-name” field.

5. Enter the number that represents the object type in the BACnet Configurator in the “object-type” field. In case of the device object, the “8”.

6. Specify the instance number of the object in the “object-instance” field. In the case of the device object, the device object instance number corresponds to the object instance number, i.e., in this example “135487” (see point 3).

Enter other objects:

7. Specify the name of the EDE object in the “#keyname” field.
   Recommendation:
   [DeviceInstanceNummer]_Device_[MAC-ID]_[Object]_[Channel]

8. In the “device obj.-instance” field, specify the instance number of the device object to which the new object is assigned, in this example “135487” because the new object is assigned to the device with device instance number “135487”.

9. Enter a freely selectable name in the “object-name” field.

10. Enter the number that represents the object type in the BACnet Configurator in the “object-type” field, e.g., “3” to create a binary input object.
    The following table shows the object types supported by the BACnet Configurator:

Table 35: Object Types Supported by the BACnet Configurator (Object Type Code)

No	Object type	No	Object type
0	Analog Input	13	Multistate Input*
1	Analog Output	14	Multistate Output*
2	Analog Value	15	Notification Class
3	Binary Input	16	-
4	Binary Output	17	Scheduler
5	Binary Value	18	Averaging
6	Calendar	19	Multistate Value
7	Command	20	Trendlog
8	Device	21	Life Safety Point
9	Event Enrollment	22	Life Safety Zone
10	File	23	Accumulator
11	Group	24	Pulse Converter
12	Loop	13	-

* These objects cannot be created with the 750-830 BACnet/IP Controller.

Optional: Import objects from WAGO-I/O-*PRO* via the EDE file:

11. Enter the name of the associated object from WAGO-I/O-*PRO* in the “vendor-specific-address” field. Prefix the program name, here “PLC_PRG” (see following Figure).
(An associated SYM_XML file is required.)

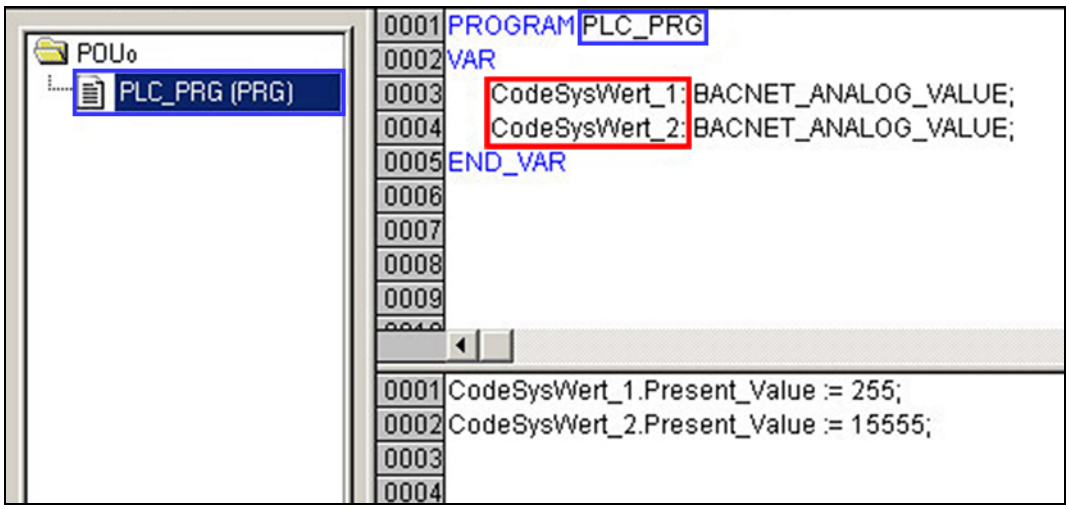


Figure 113: Data Structure in WAGO-I/O-*PRO*

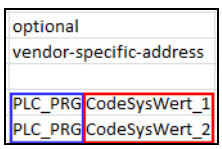


Figure 114: Vendor-Specific-Address in the EDE File with Prefixed Program Name

Optional: Create and import an EDE file to a specific module

12. In the “vendor-specific-address” field, specify the object that involves which module, e.g., “750-402_001_01” consisting of ItemNumber_AbsoluteModulePosition_ChannelNumber.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	# Proposal_Engineering-Data-Exchange - B.I.G.-EU															
2	PROJECT_NA	EDExample														
3	VERSION_OF	1														
4	TIMESTAMP_	11. Jul 14														
5	AUTHOR_OF	G. Sampler														
6	VERSION_OF	02. Jan														
7	#mandatory	mandatory	mandatory	mandatory	mandatory	o	o	o	o	o	o	o	o	o	o	optional
8	# keyname	device obj.-i	object-name	object-type	object-instar	d	p	m	m	s	s	h	lc	st	u	vendor-specific-address
9	198_Device_	198	Beispiel Dev	8	198											
10	198	198	Beispiel Digi	3	199											750-506_001_01

Figure 115: EDE file with registered “vendor-specific-address”

13. Save and close the EDE file.

14. Open the BACnet Configurator.

15. Right click on “Import” and select **Import > EDE**…

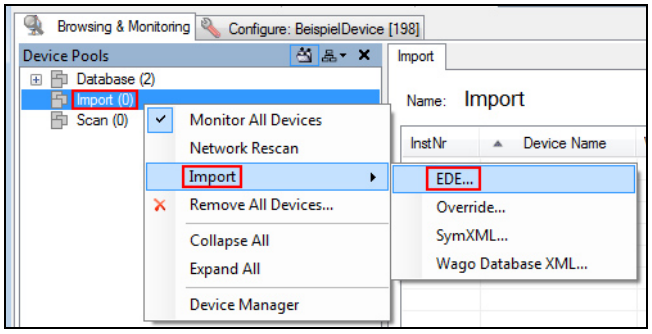


Figure 116: Importing an EDE File

A dialog window appears.

16. Select a valid EDE and EDE-State-Text file. If you want to import objects from WAGO-I/O-*PRO*, also load an SYM_XML file.

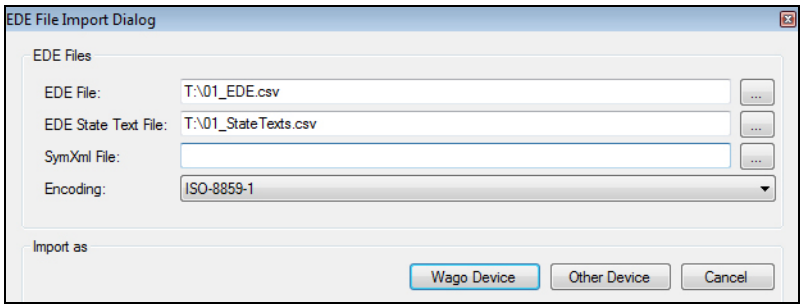


Figure 117: Importing an EDE File

17. Click **[WAGO Device]** to import the objects of the EDE and SYM_XML file.

The imported device with the objects created in the EDE and SYM_XML file appear in the Import folder. Because a WAGO device is involved, the device is marked with a “W”. In contrast to WAGO-external devices, WAGO devices can be moved to the database and can be further configured.

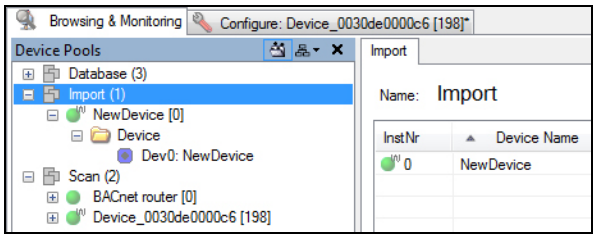


Figure 118: Imported Device

18. Right click on the device and select **Move to Database.**

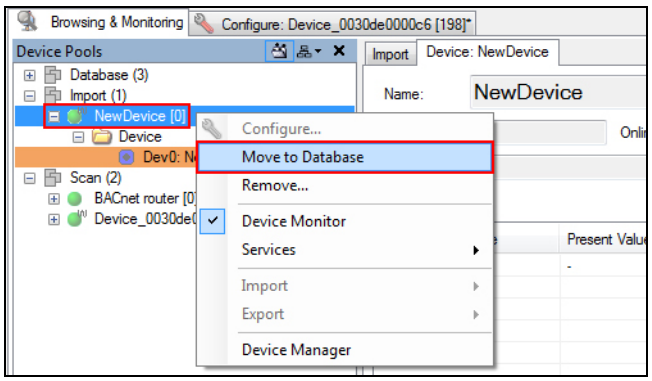


Figure 119: Transfer Device into the Database

The device is added to the database.

19. If you want to configure the device further, select **Configure** in the context menu and make changes in the configuration area, e.g., “Communication”.

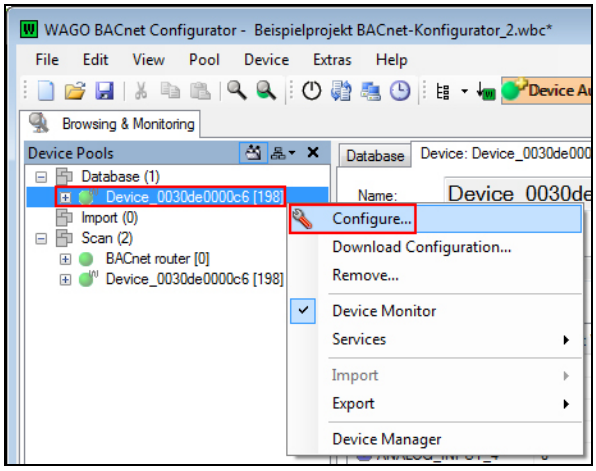


Figure 120: Open Configuration of the Device in the Database

20. Right click on **[Store and Download]** in the window.

21. Select the “Device Mac Address” in the dialog box.

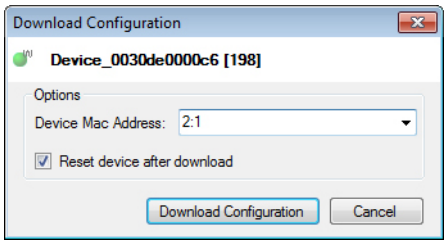


Figure 121: Load Configuration into the Fieldbus Controller

Note

Copy “Device Mac Address” from “Online Address”!
If the “Device Mac Address” does not appear in the dropdown menu:
Switch to the “Browsing & Monitoring” tab and click on the respective device in the “Scan” folder. The “Online Address” appears in the configuration area on the right side. Copy this address and paste it into the “Download Configuration” dialog.
Please refer to section “Menu Bar” > “Device” for information about the structure of the “Device Mac Address”.

22. Click on **[Download Configuration]** to download the configuration into the fieldbus controller.

5.3 Backing up and Restoring Files

You can back up and restore all configuration data of the BACnet configurator. Backing up/restoring is accomplished either via the menu item “Backup & Restore” or via the menu item “Restore with” as a quicker option.

In addition to the configuration files, other files (such as pdf files) can also be backed up, if required. As preparation, perform the following steps:

1. Create a file object.
2. Specify the path of the file in the file object as “Object Name”.
3. Change to the device object.
4. Click with the right mouse button on the property “Configuration Files” and add an element using “Add item”.
5. Specify the instance number of the created file object in the new element as “Instance Number”.
6. Select the respective file object under “Type”.

Proceed as follows to back up configuration data and additional files:

1. Open the dialog “Backup & Restore” (for example, via the menu bar Device > Services > “Backup & Restore”).

The dialog “Backup & Restore” will be opened. The default path of the data backup/restore file is displayed.

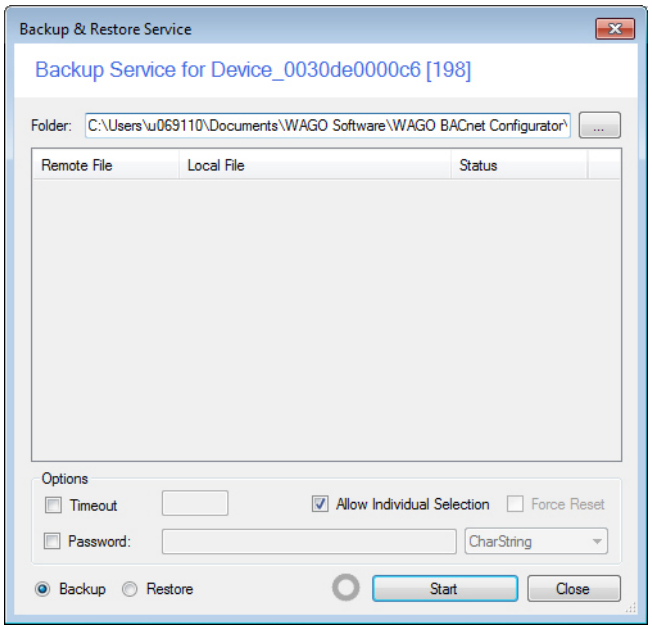


Figure 122: Dialog “Backup & Restore”

2. If you would like to backup/restore another file, click on the **[...]** button and select the corresponding file of type “*.wbr”.

Note

Ensure that the configuration data is compatible for restoring!
Ensure that the configuration data is compatible when you use the “Restore” function. For example, do not use the configuration data for a 750-830 with a model 750-831.

3. Select **Backup** or **Restore** in the left bottom window area.

4. Click on the **[Start]** button to display the configuration files and all file objects in the node.

If some of the objects are not in the object property “Configuration Files” during backup, these are highlighted in gray and cannot be selected for backup.

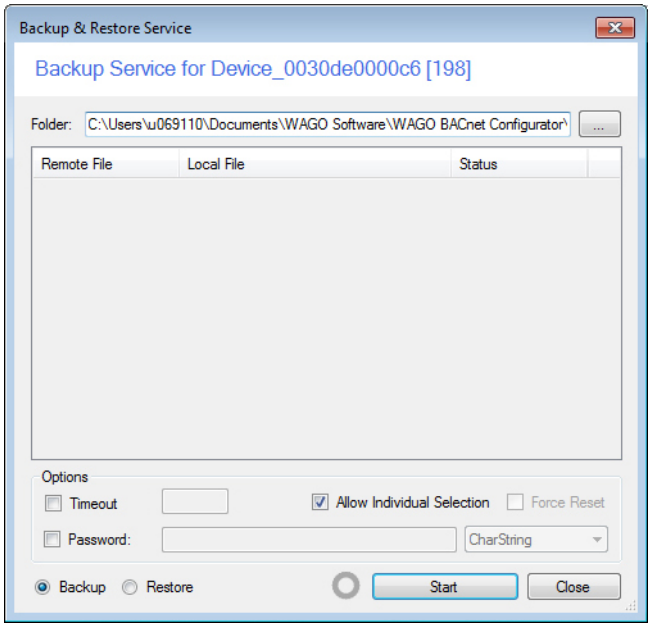


Figure 123: Dialog “Backup & Restore”

5. Click on the **[Backup Files]** or the **[Restore Files]** button to start the backup or restore process.

During a **backup**, all selected data are backed up in a file container of type “wbr”.

During **restore**, the file container *.wbr is read.
If the file object contained in the wbr file is available on the fieldbus controller, it is shown highlighted in blue, otherwise in yellow. All files with a cross-mark are restored.

5.4 Working with Persistent and Configured Values

Object property values are stored differently depending on the type of change:

1. **Change made to the runtime in the “Browsing & Monitoring” tab**
   Existing property values are changed here, transferred in the controller to the runtime using **[Commit Values]** and persistently saved there. Changes to the runtime are only possible if access to this property is permitted in the “Configure” tab (symbol).

2. **Configuration takes place on the “Configure” tab or using imported EDE files**
   Objects and their properties are created, changed or deleted in this tab. Changed properties are identified with an arrow symbol . Similarly, configuration values imported as an EDE file are marked. The marked values are loaded into the controller using **[Store and Download]** and will overwrite existing persistent data. Unconfigured standard values (without arrow symbol) will not overwrite the persistent values.

In the following, the interplay between persistent and configured values is explained by three property values of the Analog Value Object.

1. Open the **“Configure”** tab.

Consider the following properties of the standard configuration as examples:

Table 36: Properties of the Standard Configuration

Name	Value	Acc	Mod
COV Increment	0		
Deadband	0		
Low Limit	0		

2. Change two of the values and click on one of the lock symbols in the “Acc” column. This will lock this value from being changed in the run-time.

Table 37: Changed Values

Name	Value	Acc	Mod
COV Increment	10		
Deadband	20		
Low Limit	0		

Changed values (“Value”) or permitted/blocked access (“Acc”) are identified as modified in the “Mod” column with an arrow.

3. Click on the button **[Store and Download]** to download the configuration and store it in the controller.

4. Change over to the **“Browsing & Monitoring”** tab**.**

5. Click with the right mouse button in the “Scan” pool on the device with the changed values and select **“Rescan selected Device(s)”** in the context menu.

The following life values from the previous configuration are displayed:

Table 38: Life Values

Name	Value
COV Increment	10
Deadband	20
Low Limit	0

6. Change the life values of the properties:

Table 39: Change the Life Values

Name	Value
COV Increment	100
Deadband	200
Low Limit	300

7. Click on the [Commit Values] button to transfer the values to the runtime into the controller.

The changes for “Deadband” and “Low Limit” are taken over. “COV Increment” is not changed since you have blocked this property in the “Configure” tab (red lock):

Table 40: Changes for “Deadband” and “Low Limit”

Name	Value
COV Increment	10
Deadband	200
Low Limit	300

8. Change in the **“Configure” tab**.

You are shown the last configuration:

Table 41: Last configuration

Name	Value	Acc	Mod
COV Increment	10		
Deadband	20		
Low Limit	0		

9. Download this configuration again using **[Store and Download]** into your controller.

10. Change over to the **“Browsing & Monitoring” tab**.

11. Click with the right mouse button in the “Scan” pool on the device with the changed values and select **“Rescan selected Device(s)”** in the context menu.

The values for “COV Increment” and “Deadband” were taken over from the configuration. The value for “Low Limit” was not changed in the configuration (no arrow symbol). For this reason, the persistent value that was transferred to the runtime using “Commit Values” is shown here:

Table 42: “Commit Values”

Name	Value
COV Increment	10
Deadband	20
Low Limit	300

5.5 Creating a Client Mapping

1. Open the “Configure” tab.

2. Choose an object in the “Inputs” folder, e.g. **Analog Output 0**.

3. Right click on a property and choose **Client Mappings**...

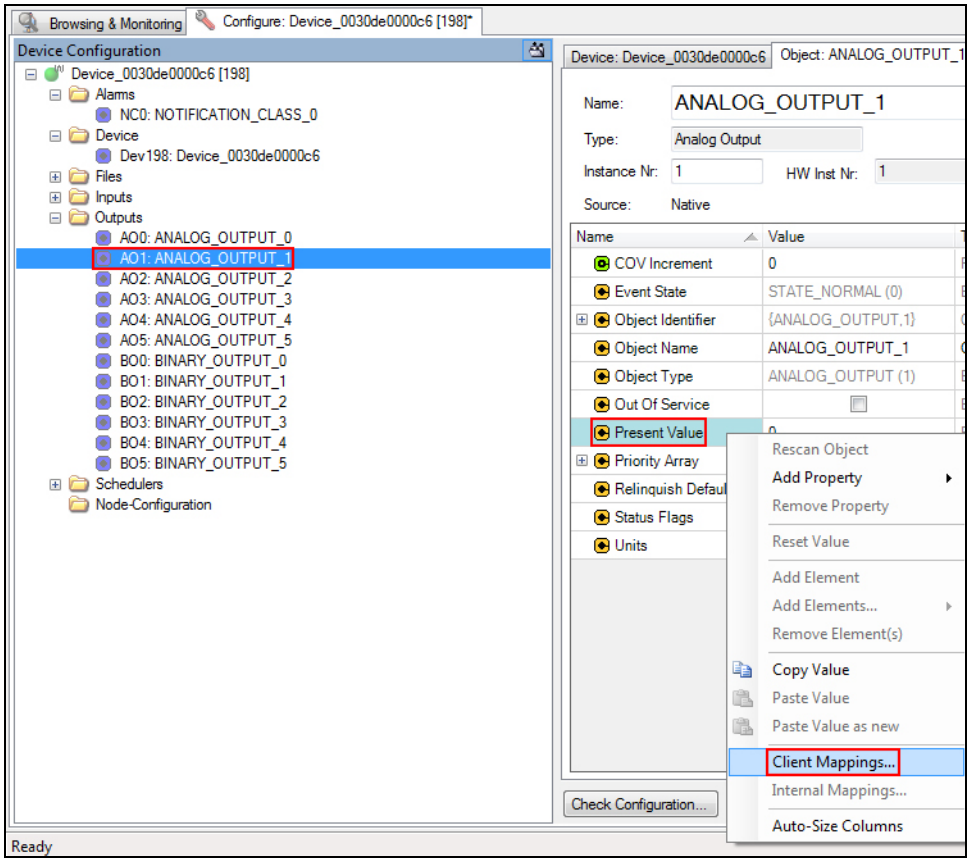


Figure 124: Opening the Client Mapping Editor

The Client Mapping Editor is opened in a non-modal dialog.

4. Select the object **Analog Output** to the left and the property **Present Value** to the right in the main window.

The Client Mapping Editor indicates the existing linkable properties for the currently selected property in the main window.

Now, the property “Present Value” of the “Analog Input” of a local device is supposed to be read and written to the “Present Value” of the local object “Analog Output”:

5. Choose a device in the Client Mapping Editor.

6. Select the object Analog Input underneath the device and the property Present Value below that.

7. Now link the **Present Value** of the selected **Analog Input Object** in the Editor with the **Present Value** of the local **Analog Output Object** selected in the main window by clicking on **[Add Read Map]**.

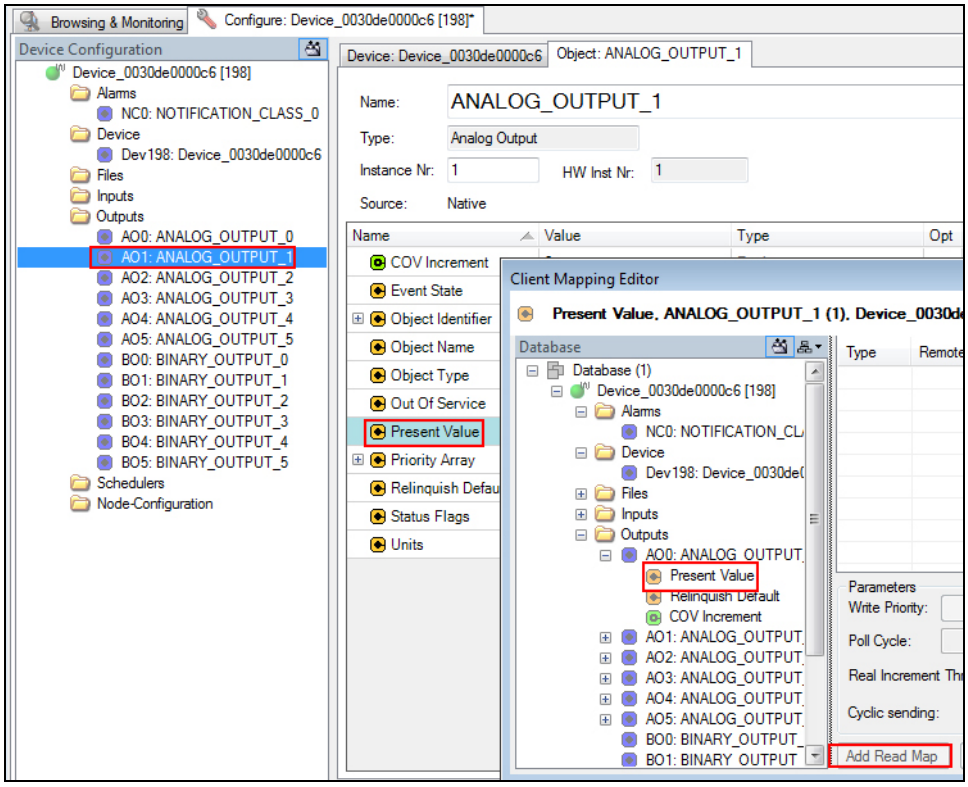


Figure 125: Non-Modal Client Mapping Editor

The link is displayed in the dialog to the right.

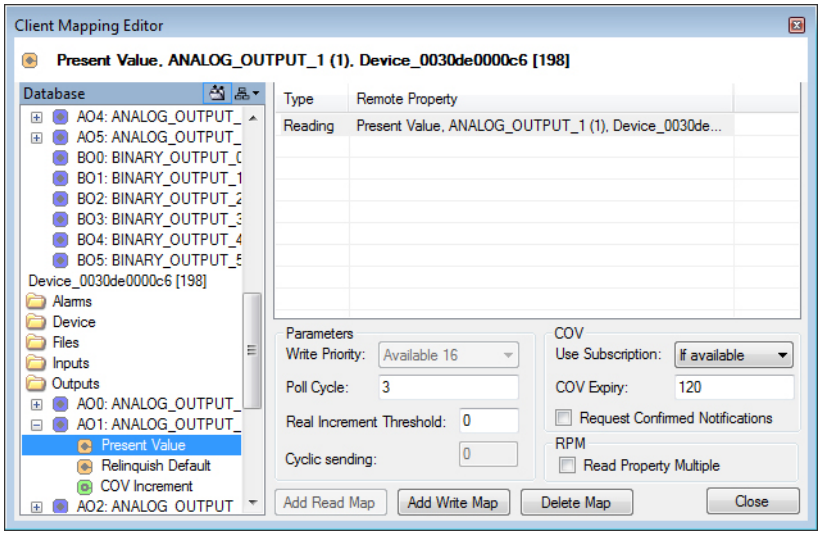


Figure 126: Successful Linking in the Client Mapping Editor

The created link is further parameterized

8. Choose the setting “If available” under **Use Subscription.**

With this setting, only changes in value are transmitted (COV). If no COV is possible, values are transmitted by “Polling”. The time interval for polling is established using the “Poll Cycle”:

9. Select a **Poll Cycle** of 3 seconds, for example.

10. Then click on **[Close]** and close the Editor.

11. Click on **[Store and Download]** to store the Client Mapping and load it to the controller or continue with the configuration.

5.6 Creating an Internal Mapping

In the following, you will create links between BACnet properties and IEC variables.

1. Open the “Configure” tab.

2. Choose the device in the tree to the left.

3. In the configuration area, click beside the input field SYM_XML on the button **[Import]**.

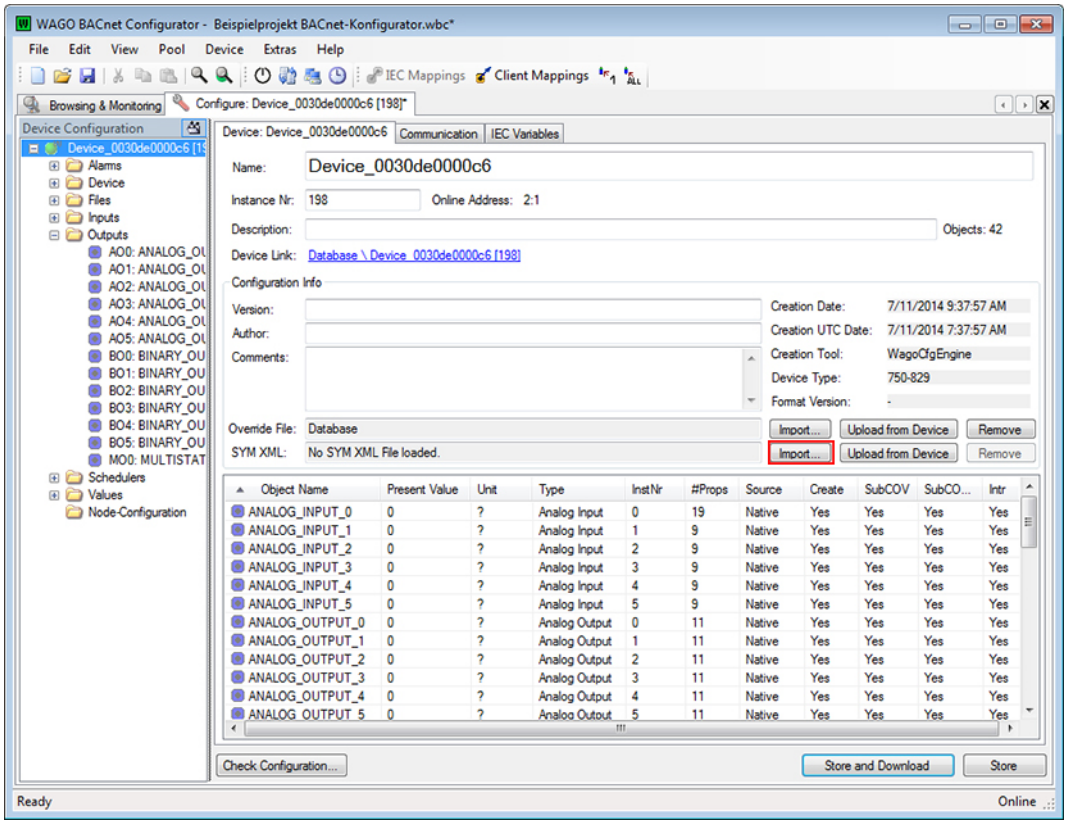

WAGO BACnet Configurator - Beispielprojekt BACnet-Konfigurator.wbc*
File Edit View Pool Device Extras Help
IEC Mappings Client Mappings
Browsing & Monitoring
Configure: Device_0030de0000c6 [198]*
Device Configuration
Device_0030de0000c6 [19
Alarms
Device
Files
Inputs
Outputs
AO0: ANALOG_OU
AO1: ANALOG_OU
AO2: ANALOG_OU
AO3: ANALOG_OU
AO4: ANALOG_OU
AO5: ANALOG_OU
BO0: BINARY_OU
BO1: BINARY_OU
BO2: BINARY_OU
BO3: BINARY_OU
BO4: BINARY_OU
BO5: BINARY_OU
MO0: MULTISTAT
Schedulers
Values
Node-Configuration
Device: Device_0030de0000c6
Communication
IEC Variables
Name: Device_0030de0000c6
Instance Nr: 198
Online Address: 2:1
Description:
Objects: 42
Device Link: Database \ Device_0030de0000c6 [198]
Configuration Info
Version:
Author:
Comments:
Creation Date: 7/11/2014 9:37:57 AM
Creation UTC Date: 7/11/2014 7:37:57 AM
Creation Tool: WagoCfgEngine
Device Type: 750-829
Format Version: -
Override File: Database
SYM XML: No SYM XML File loaded.
Import...
Upload from Device
Remove
Import...
Upload from Device
Remove
Object Name | Present Value | Unit | Type | InstNr | #Props | Source | Create | SubCOV | SubCO... | Intr
ANALOG_INPUT_0 0 ? Analog Input 0 19 Native Yes Yes Yes Yes
ANALOG_INPUT_1 0 ? Analog Input 1 9 Native Yes Yes Yes Yes
ANALOG_INPUT_2 0 ? Analog Input 2 9 Native Yes Yes Yes Yes
ANALOG_INPUT_3 0 ? Analog Input 3 9 Native Yes Yes Yes Yes
ANALOG_INPUT_4 0 ? Analog Input 4 9 Native Yes Yes Yes Yes
ANALOG_INPUT_5 0 ? Analog Input 5 9 Native Yes Yes Yes Yes
ANALOG_OUTPUT_0 0 ? Analog Output 0 11 Native Yes Yes Yes Yes
ANALOG_OUTPUT_1 0 ? Analog Output 1 11 Native Yes Yes Yes Yes
ANALOG_OUTPUT_2 0 ? Analog Output 2 11 Native Yes Yes Yes Yes
ANALOG_OUTPUT_3 0 ? Analog Output 3 11 Native Yes Yes Yes Yes
ANALOG_OUTPUT_4 0 ? Analog Output 4 11 Native Yes Yes Yes Yes
ANALOG_OUTPUT_5 0 ? Analog Output 5 11 Native Yes Yes Yes Yes
Check Configuration...
Store and Download
Store
Ready
Online

Figure 127: Importing a SYM_XML File

4. Open the SYM_XML File.

Below the device, the new objects that are defined in the SYM_XML file are displayed in a folder labeled “IEC Variables”.

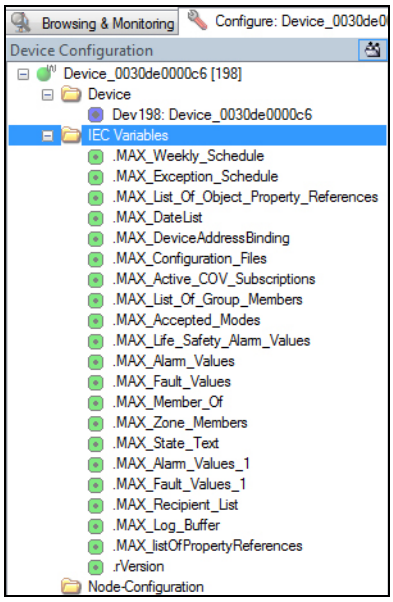


Figure 128: Importing a SYM_XML File

The IEC variables are also displayed in the configuration area in registry IEC Variables.

You will see all IEC variables of the SYM_XML file. In the SYM_XML file, whole objects are also defined. Variables that belong to these objects and are therefore already linked can no longer be bound with other properties using the BACnet Configurator.

BACnet properties that are not permanently bound with IEC variables in the SYM_XML file can be linked, however.

5. For example, click in the tree of the main window on **Analog Output** and select in the context menu of property **Out of Service** the menu item **Internal Mappings…**.

The “IEC Mapping Editor” is opened in a non-modal dialog.

The “IEC Mapping Editor” displays a selection of IEC variables that can be bound to the selected property.

6. By using **[Set Mapping]**, link **Out of Service** of the **Analog Output Object** with a selected IEC variable of the IEC Mapping Editor.

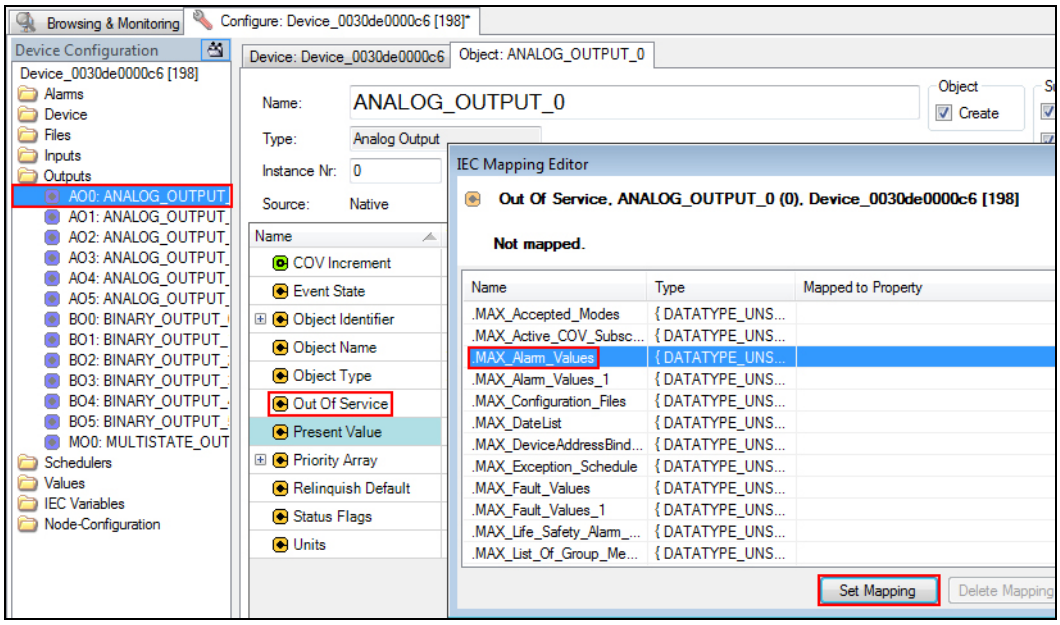


Figure 129: Internal Mapping

The bound property is displayed behind the IEC variable under “Mapped to Property”.

7. Click on the device to the left in the tree and on the “IEC Variables” tab.

The BACnet property (“Out of Service”) bound to the IEC variable (“Max_Alarm_Values”) is displayed again under “Mapped to Property”.

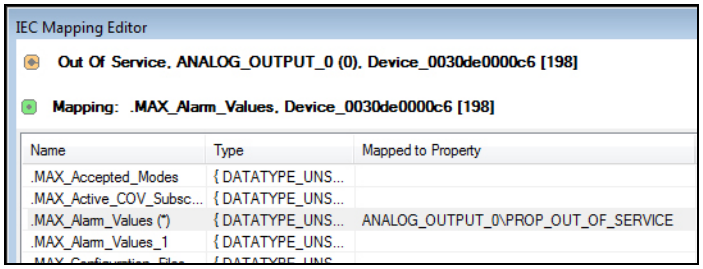


Figure 130: Internal Mapping Successful

8. Click on **[Store and Download]** to store the Client Mapping and load it to the controller or continue with the configuration.

6 Appendix

6.1 List of BACnet Engineering Units

Table 43: BACnet Engineering Units

Code	BACnet Engineering Unit	Code	BACnet Engineering Unit
0	SQUARE_METERS	94	DEGREES_FAHRENHEIT_PER_HOUR
1	SQUARE_FEET	95	NO_UNITS
2	MILLIAMPERES	96	PARTS_PER_MILLION
3	AMPERES	97	PARTS_PER_BILLION
4	OHMS	98	PERCENT
5	VOLTS	99	PERCENT_PER_SECOND
6	KILOVOLTS	100	PER_MINUTE
7	MEGAVOLTS	101	PER_SECOND
8	VOLT_AMPERES	102	PSI_PER_DEGREE_FAHRENHEIT
9	KILOVOLT_AMPERES	103	RADIANS
10	MEGAVOLT_AMPERES	104	REVOLUTIONS_PER_MINUTE
11	VOLT_AMPERES_REACTIVE	105	CURRENCY1
12	KILOVOLT_AMPERES_REACTIVE	106	CURRENCY2
13	MEGAVOLT_AMPERES_REACTIVE	107	CURRENCY3
14	DEGREES_PHASE	108	CURRENCY4
15	POWER_FACTOR	109	CURRENCY5
16	JOULES	110	CURRENCY6
17	KILOJOULES	111	CURRENCY7
18	WATT_HOURS	112	CURRENCY8
19	KILOWATT_HOURS	113	CURRENCY9
20	BTUS	114	CURRENCY10
21	THERMS	115	SQUARE_INCHES
22	TON_HOURS	116	SQUARE_CENTIMETERS
23	JOULES_PER_KILOGRAM_DRY_AIR	117	BTUS_PER_POUND
24	BTUS_PER_POUND_DRY_AIR	118	CENTIMETERS
25	CYCLES_PER_HOUR	119	POUNDS_MASS_PER_SECOND
26	CYCLES_PER_MINUTE	120	DELTA_DEGREES_FAHRENHEIT
27	HERTZ	121	DELTA_KELVINS
28	GRAMS_OF_WATER_PER_ KILOGRAM_ DRY_AIR	122	DELTA_KELVINS
		123	KILOHMS
29	PERCENT_RELATIVE_HUMIDITY	124	MEGOHMS
30	MILLIMETERS	125	MILLIVOLTS
31	METERS	126	KILOJOULES_PER_KILOGRAM
32	INCHES	127	MEGAJOULES
33	FEET	128	JOULES_PER_DEGREE_KELVIN
34	WATTS_PER_SQUARE_FOOT	129	JOULES_PER_DEGREE_KELVIN
35	WATTS_PER_SQUARE_METER	130	JOULES_PER_KILOGRAM_DEGREE_ KELVIN
36	LUMENS	131	JOULES_PER_KILOGRAM_DEGREE_ KELVIN
37	LUX	132	KILOHERTZ
38	FOOT_CANDLES	133	MEGAHERTZ
39	KILOGRAMS	134	PER_HOUR
40	POUNDS_MASS	135	MILLIWATTS
41	TONS	136	HECTOPASCALS

Table 43: BACnet Engineering Units

Code	BACnet Engineering Unit	Code	BACnet Engineering Unit
42	KILOGRAMS_PER_SECOND	137	MILLIBARS
43	KILOGRAMS_PER_MINUTE	138	CUBIC_METERS_PER_HOUR
44	KILOGRAMS_PER_HOUR	139	LITERS_PER_HOUR
45	POUNDS_MASS_PER_MINUTE	140	KILOWATT_HOURS_PER_SQUARE_METER
46	POUNDS_MASS_PER_HOUR	141	KILOWATT_HOURS_PER_SQUARE_FOOT
47	WATTS	142	MEGAJOULES_PER_SQUARE_METER
48	KILOWATTS	143	MEGAJOULES_PER_SQUARE_FOOT
49	MEGAWATTS	144	WATTS_PER_SQUARE_METER_DEGREE_KELVIN
50	BTUS_PER_HOUR	145	WATTS_PER_SQUARE_METER_DEGREE_KELVIN
51	HORSEPOWER	146	CUBIC_FEET_PER_SECOND
52	TONS_REFRIGERATION	147	PERCENT_OBSCURATION_PER_FOOT
53	PASCALS	148	PERCENT_OBSCURATION_PER_METER
54	KILOPASCALS	149	MILLIOHMS
55	BARS	150	MEGAWATT_HOURS
56	POUNDS_FORCE_PER_SQUARE_INCH	151	KILO_BTUS
57	CENTIMETERS_OF_WATER	152	MEGA_BTUS
58	INCHES_OF_WATER	153	KILOJOULES_PER_KILOGRAM_DRY_AIR
59	MILLIMETERS_OF_MERCURY	154	MEGAJOULES_PER_KILOGRAM_DRY_AIR
60	CENTIMETERS_OF_MERCURY	155	KILOJOULES_PER_KELVIN

6.2 Compatibility with Configurator and Firmware Version

When using the Configurator in conjunction with the firmware version of your fieldbus controller, please note the following:

General

Backup data created with a version previous to Configurator version 1.7 or higher cannot be processed. It is therefore explicitly recommended when changing to Configurator version 1.7 to create new backup files with version 1.7.

Configurator Version 1.7 together with the BACnet/IP Controller with Firmware 01.04.27(03).

An error message that can be ignored by clicking the **[Continue]** button appears when reading the configuration.

List of Figures

Figure 1: Start Installation 13
Figure 2: Confirm the License Agreement 13
Figure 3: Choose the Installation Location 14
Figure 4: Continue Installation 14
Figure 5: Continue Installation 15
Figure 6: Installing Merger and Finishing the Installation 15
Figure 7: End Installation 17
Figure 8: Properties of the BACnet Service 17
Figure 9: Properties of the BACnet Service 18
Figure 10: Stop or Restart the BACnet Service 18
Figure 11: Message Box for Restricted Functionality 19
Figure 12: “terminal.csv” Excerpt 27
Figure 13: Graphical User Interface 29
Figure 14: “Browsing & Monitoring” tab 30
Figure 15: “Structured View” 31
Figure 16: Transaction Log 31
Figure 17: Search for BACnet devices 32
Figure 18: Synchronize time 33
Figure 19: Importing an EDE file 34
Figure 20: Exporting an EDE file 35
Figure 21: Downloading of the configuration 36
Figure 22: Delete device 37
Figure 23: Monitor devices 37
Figure 24: Reset Device 37
Figure 25: Backup and Restoration 38
Figure 26: Backup Files 39
Figure 27: Service Settings 40
Figure 28: Synchronize Time 41
Figure 29: Add Object 42
Figure 30: Supplementary Settings 43
Figure 31: Creating a Log File 44
Figure 32: Views 47
Figure 33: Changing the View via the Toolbar 47
Figure 34: “Device Pools” 48
Figure 35: Adding Folders to the Structured View 50
Figure 36: Structured View Register 50
Figure 37: Incorporating objects in the Structured View 50
Figure 38: Structured View Register 51
Figure 39: Pool context menu 53
Figure 40: Configuration Area of the Pool 53
Figure 41: Context Menu of the Device 54
Figure 42: Configuration Area of the Device 55
Figure 43: Scaling Values 56
Figure 44: Configuration of Device, Configure View 58
Figure 45: Object Context Menu 60
Figure: 46: Broadcast via BBMD 60
Figure 47: Configuration of “BBMD” 61
Figure 48: Adding a BBMD 62

Figure 49: Configuration of Communication 63
Figure 50: Setting a Password 64
Figure 51: Configuration of IEC Variables 65
Figure 52: Client Mapping Editor 66
Figure 53: “Node Configuration” Context Menu 67
Figure 54: Insert Terminal 68
Figure 55: Check for a Valid Configuration 69
Figure 56: Displaying Warnings 69
Figure 57: Storing and Downloading Settings 69
Figure 58: Scanning again one or several Objects in Scan Pool 70
Figure 59: Configuration of “Object”, View in the “Browsing & Monitoring” Tabs 71
Figure 60: Configuration of “Object", View in the “Configure” Tabs 73
Figure 61: Properties Context Menu 75
Figure 62: Open “Device Manager” 76
Figure 63: Tree Structure in the “Device Manager” 76
Figure 64: “Object Manager” 77
Figure 65: Sort Settings 78
Figure 66: Edit Profile 78
Figure 67: Context Menu “Object Manager” 79
Figure 68: “Client Mappings” in the “Client Mapping Editor” 80
Figure 69: Sort Settings 81
Figure 70: Edit Profile 82
Figure 71: Context Menu “Internal Mapping” 82
Figure 72: Internal Mapping in the IEC Mapping Editor 83
Figure 73: “Internal Mapping” in the “Device Manager” 84
Figure 74: Context Menu “Internal Mapping” 84
Figure 75: “Multi Controller Projects” 85
Figure 76: Context Menu “Multi Controller Projects” 85
Figure 77: “Device manager”, “Multistate” Tab 86
Figure 78: Defining State Texts 86
Figure 79: State Text in the Object Configuration 87
Figure 80: Automatic Device Search Disabled (Left) or Enabled (Right) 90
Figure 81: Device with Its Objects 91
Figure 82: Three Possibilities for Configuring a Device 91
Figure 83: Add Objects Using the Context Menu 92
Figure 84: Newly Created Objects 92
Figure 85: Adding Properties 93
Figure 86: Adding Elements 93
Figure 87: New Element 93
Figure 88: Defining the Calendar 94
Figure 89: Changing Entries in Elements 94
Figure 90: Changing Entries in Elements 94
Figure 91: Entering Values in the Calendar 95
Figure 92: Adding Holidays 95
Figure 93: Adding Several New Elements 96
Figure 94: Entering an exception date 96
Figure 95: Entering New Recipients for Alarms 97
Figure 96: Configuring New Recipients 97
Figure 97: Adding the property “Notification Class” to the Analog Input Object 98

Figure 98: New Properties when Adding the Property “Notification Class” 98
Figure 99: Enabling and Disabling theProperties 99
Figure 100: Entering Values 99
Figure 101: Uploading the Configuration 99
Figure 102: Updating the device via “Rescan device” 100
Figure 103: New Folders for “Schedules” and “Alarms” 100
Figure 104: Transmitting Values Directly via “Commit Value” 101
Figure 105: Successful Value Transmission 101
Figure 106: Transmission of Several Values 101
Figure 107: Several values successfully transferred, status OK 102
Figure 108: Imported Device with Device Object and Four BI Objects 107
Figure 109: EDE File with no Registered “Vendor-specific-address” as a Reference 108
Figure 110: Imported Device with Device Object and only One BI Object 108
Figure 111: Hardware instance Number of the Object 109
Figure: 112: Creating a Device Object 110
Figure 113: Data Structure in WAGO-I/O-*PRO* 111
Figure 114: Vendor-Specific-Address in the EDE File with Prefixed Program Name 111
Figure 115: EDE file with registered “vendor-specific-address” 112
Figure 116: Importing an EDE File 112
Figure 117: Importing an EDE File 112
Figure 118: Imported Device 113
Figure 119: Transfer Device into the Database 113
Figure 120: Open Configuration of the Device in the Database 113
Figure 121: Load Configuration into the Fieldbus Controller 114
Figure 122: Dialog “Backup & Restore” 115
Figure 123: Dialog “Backup & Restore” 116
Figure 124: Opening the Client Mapping Editor 120
Figure 125: Non-Modal Client Mapping Editor 121
Figure 126: Successful Linking in the Client Mapping Editor 121
Figure 127: Importing a SYM_XML File 123
Figure 128: Importing a SYM_XML File 124
Figure 129: Internal Mapping 125
Figure 130: Internal Mapping Successful 125

List of Tables

Table 1: Number Notation ... 8
Table 2: Font Conventions ... 8
Table 3: Minimum system requirements ... 10
Table 4: Functions in Restricted Mode (DEMO Mode) ... 19
Table 5: Other Objects, in Addition to the Automatically Installed Objects, Can also Be Created ... 22
Table 6: Objects that are not Created Using BACnet Configurator ... 22
Table 7: BACnet Services ... 24
Tabelle 8: Legende zur Abbildung „Grafische Benutzeroberfläche“ ... 29
Table 9: Menu Item File ... 30
Table 10: Menu Item Edit ... 30
Table 11: Menu item View ... 30
Table 12: Menu Item Pool ... 32
Table 13: Menu Item Device ... 36
Table 14: Menu Item Extras ... 43
Table 15: Menu Item Help ... 44
Table 16: Toolbar ... 45
Table 17: Structured View Register ... 51
Table 18: Configuration area of the pool ... 54
Table 19: Configuration area of the Device ... 55
Table 20: Configuration of Device, Configure View ... 58
Table 21: Configuration “BBMD” ... 61
Table 22: Configuration of Communication ... 63
Table 23: Configuration of IEC Variables ... 66
Table 24: Node-Configuration ... 68
Table 25: Checkbox ... 69
Table 26: Configuration Area ... 70
Table 27: Symbols for required/optional properties and monitoring ... 71
Table 28: Object view in the “Browsing & Monitoring” tabs: ... 71
Table 29: Additional Options in the “Configure” Tab ... 74
Table 30: Selection possibilities ... 75
Table 31: Context Menu Selection Options ... 77
Table 32: Client Mapping Editor ... 81
Table 33: IEC Mapping Editor ... 83
Table 34: Dialog window “Multi Controller Projects” ... 85
Table 35: Object Types Supported by the BACnet Configurator (Object Type Code) ... 111
Table 36: Properties of the Standard Configuration ... 117
Table 37: Changed Values ... 117
Table 38: Life Values ... 118
Table 39: Change the Life Values ... 118
Table 40: Changes for “Deadband” and “Low Limit” ... 118
Table 41: Last configuration ... 118
Table 42: “Commit Values” ... 119
Table 43: BACnet Engineering Units ... 126

WAGO Kontakttechnik GmbH & Co. KG
Postfach 2880 • D-32385 Minden
Hansastraße 27 • D-32423 Minden
Phone: +49/5 71/8 87 – 0
Fax: +49/5 71/8 87 – 1 69
E-Mail: info@wago.com

Internet: http://www.wago.com